THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[REGISTERED AS A NEWSPAPER.]

VOL. XXIII. No. 581.] LONDON, JUNE 30, 1874. [26TH YEAR.] Price 6d.

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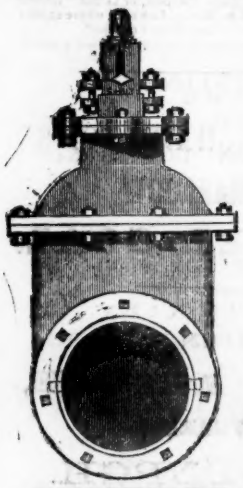
C. & W. WALKERS' DOUBLE-FACED GAS-VALVES.



These solidly constructed double-faced Gas-Valves are superseding the old system of the light, single-faced disc, which is too uncertain and unreliable in large bores.

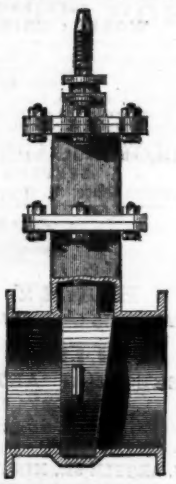
They are guaranteed absolutely gas-tight. They are very massive and rigid, and by improved modes of manufacture they are produced at very little excess in cost over the old light, weak system, which is liable to spring and bend, and become leaky.

The Valve is a rigid wedge of solid cast iron, having two perfectly scraped surfaced facings fitting between the two on the body, which are also surfaced.

A spring in two short halves, and, therefore, not liable to break, is used only for scraping the front facing clean.

The front facing is vertical; the back facing forms the wedge.

At a slight additional expense both flanges are faced to bolt to main-pipes.



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By use of which Man-lid, inlet and outlet pipes can be examined and cleansed without loss of gas in crown of holder, or ingress of atmospheric air.

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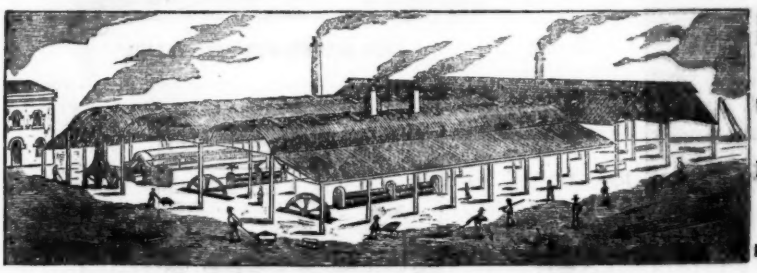

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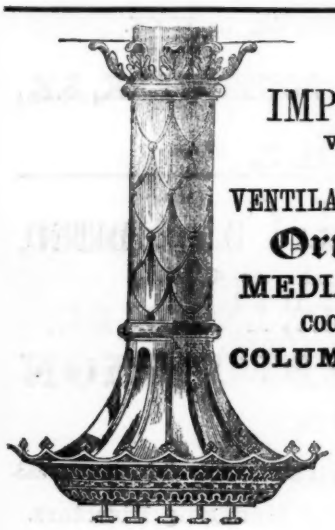

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IMPROVED VENTILATING SUN-LIGHTS

WITH TALC REFLECTORS AND SELF-ACTING VALVES

TO PREVENT DOWN-DRAUGHT;

VENTILATING GLOBE LIGHTS for DINING-ROOMS, LIBRARIES, &c.

Ormolu, Bronze, & Crystal Gaseliers;

MEDIÆVAL CHURCH WORK AND CORONÆ

COCKS, VALVES, and FITTINGS for GAS, STEAM, and WATER;

COLUMNS, BRACKETS, & STREET LANTERNS;

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GAS ENGINEERS,

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Drawings and Prices upon application.

GEORGE WALLER & CO.,

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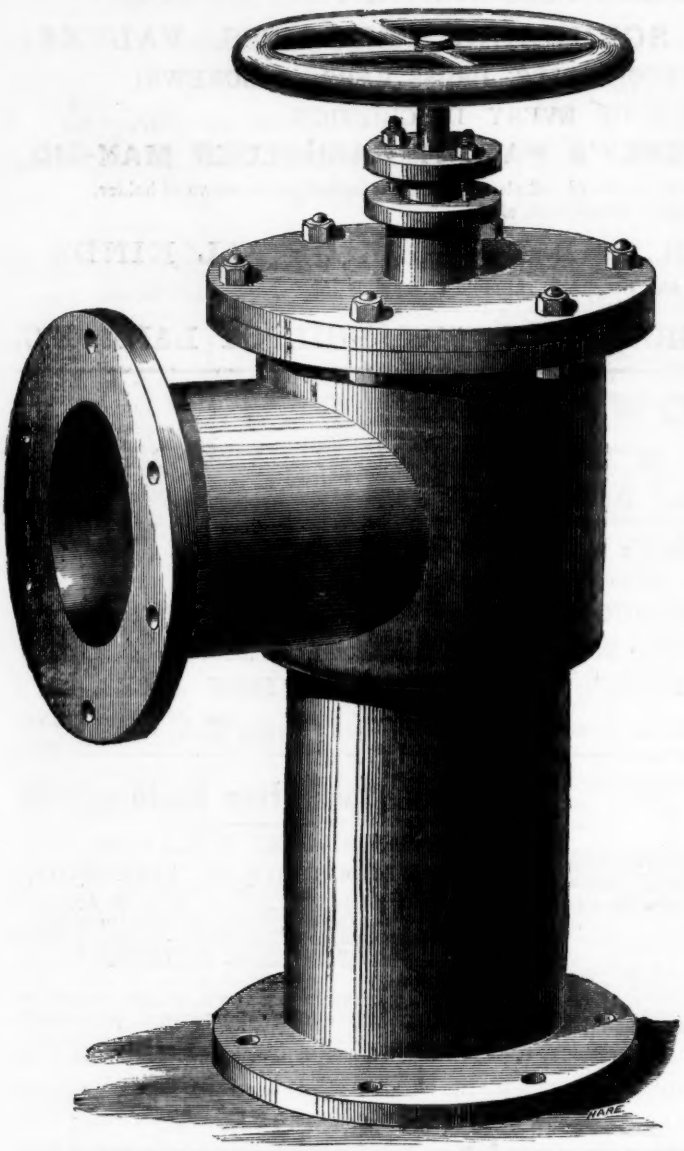
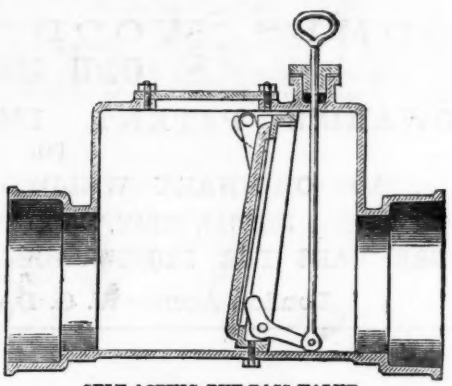
BEALE'S IMPROVED PATENT GAS-EXHAUSTERS, COMBINED ENGINES AND EXHAUSTERS.

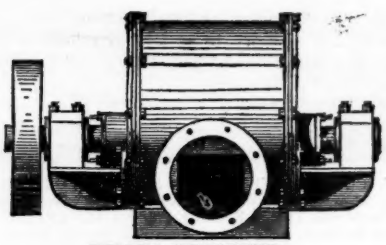


DISC GAS-VALVE.

These Valves have been specially designed by G. Waller and Co. for Beale's Exhausters. They are most effective in action, and have given universal satisfaction. They can also be made with spigot at base, to suit ordinary socket connexions.



SELF-ACTING BYE-PASS VALVE.



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PHŒNIX ENGINEERING WORKS, HOLLAND STREET, SOUTHWARK, S.E.,

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CONTRACTORS FOR GAS PURIFICATION BY OXIDE OF IRON.

The superiority of the material supplied by this Company is generally recognized, and it is now in use in nearly all the London and most of the large Provincial Gas-Works.

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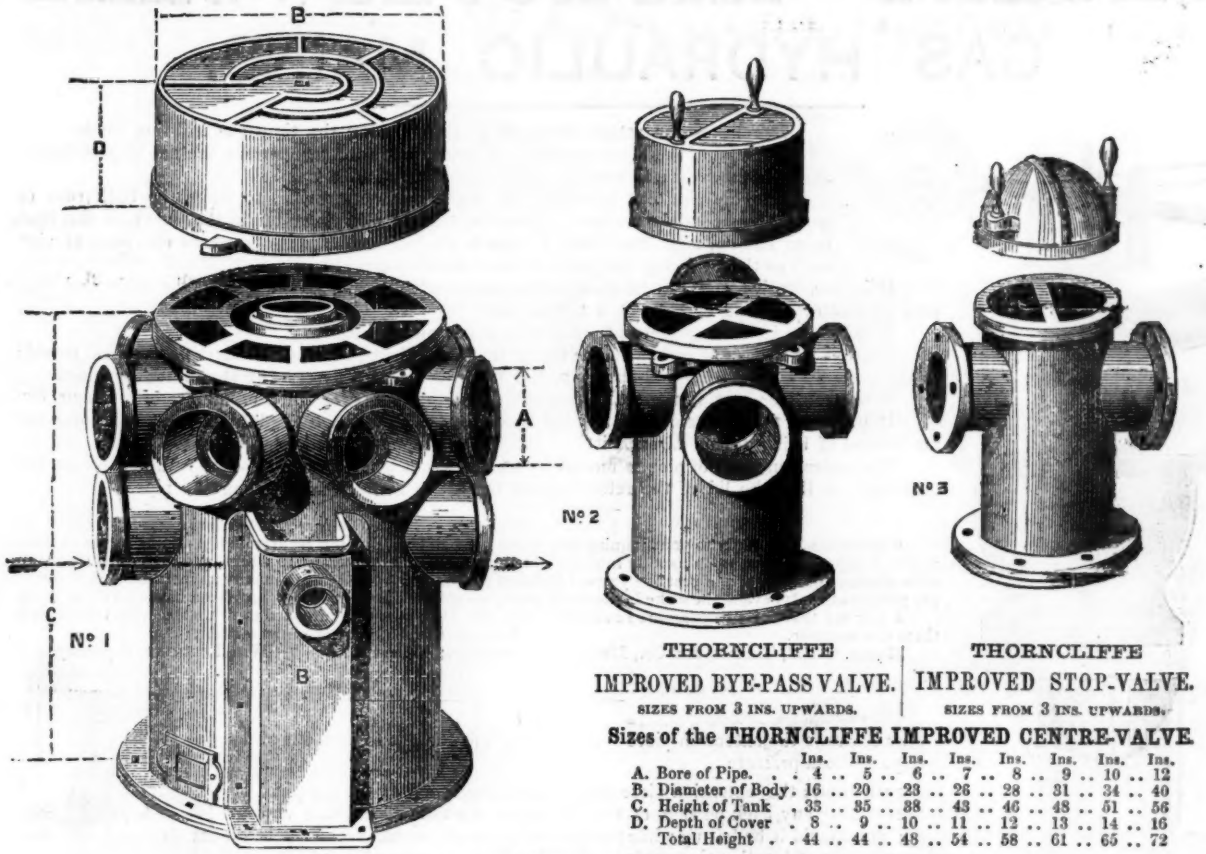
THORNCLIFFE IRON-WORKS, NEAR SHEFFIELD.

IMPROVED CENTRE-VALVES.



THORNCLIFFE IMPROVED BYE-PASS VALVE. SIZES FROM 3 INS. UPWARDS.

THORNCLIFFE IMPROVED STOP-VALVE. SIZES FROM 3 INS. UPWARDS.

Sizes of the THORNCLIFFE IMPROVED CENTRE-VALVE.

	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
A. Bore of Pipe. . .	4 ..	5 ..	6 ..	7 ..	8 ..	9 ..	10 ..	12
B. Diameter of Body.	16 ..	20 ..	23 ..	26 ..	28 ..	31 ..	34 ..	40
C. Height of Tank .	33 ..	35 ..	38 ..	43 ..	46 ..	48 ..	51 ..	56
D. Depth of Cover .	8 ..	9 ..	10 ..	11 ..	12 ..	13 ..	14 ..	16
Total Height . .	44 ..	44 ..	48 ..	54 ..	58 ..	61 ..	65 ..	72

In all cases the Covers are cast heavy enough to resist any required pressure.

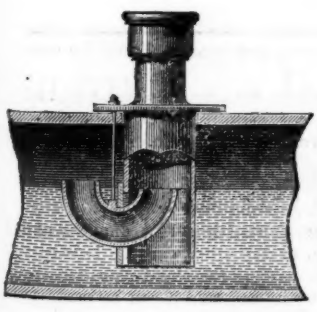
The advantages derived from the adoption of these Valves are so manifest and cardinal that in the immediate character of the change—the simplicity of the machine—the facility affording for cleaning out connexions between Valve and Purifier—the perfect collection and delivery by suitable overflow of the ammonia, at a greatly diminished depth from ground-line over the old form of Valve—the advantage of connecting on the same level, and at any angle, or opposite to each other, the inlet and outlet pipes without dip or rise—the clear acquisition of space in the purifying-house, by being able to place the boxes nearer together, the new Valve being entirely under the floor—and lastly, though of the greatest importance, the passage of crude and unpurified gas during the change is minimized to the merest fraction, thus preventing the fouling by impure gas the delicate machinery and easily affected exposed movements of the station-meter, thereby preventing the introduction of the enemy (unpurified gas) into the gasholder. Also a dead abutment is offered to all back pressure, imparting thereby to the gauges, governors, and hydraulic seals, a steadiness of action never realized with the once famous, but now fast becoming obsolete, Hydraulic Centre-Valve.

N., C., and Co. also Manufacture and Erect

PURIFIERS, CONDENSERS, SCRUBBERS, GASHOLDERS, ROOFS,

And every description of Gas Machinery.

TENDERS GIVEN FOR WORK FIXED COMPLETE IN ANY PART OF THE KINGDOM.



Messrs. N. C. & Co. are also the Sole Agents for

HAWKINS' PATENT SELF-ACTING DIP-PIPES.

These Patent Self-Acting Dip-Pipes are rapidly coming into general use by gas companies. By their use the whole of the pressure caused by the old kind of Dip-Pipes is entirely removed, therefore the yield of gas per ton of coal is considerably increased. They also act as a perfect safeguard against the deposit of carbon (or scurf) inside the retorts.

A saving of fuel is effected, and the wear and tear to the retorts greatly diminished.

They are also perfectly Self-Acting, they being regulated solely by the gas. They cannot get out of repair, and when once fixed, will last as long as the old kind, and can be easily adjusted should the hydraulic main sink; they can also be worked with advantage where there is no exhauster.

Testimonials can be had from Herbert Unwin, Esq., engineer of the Sheffield United Gaslight Company and the Penistone Gas Company. At both these companies works they have been in constant operation for several months. Further testimonials can be had on application to the Patentee, J. G. Hawkins, Effingham Street Gas-Works, Sheffield.

For Prices, &c., apply to

Messrs. NEWTON, CHAMBERS, & CO.,

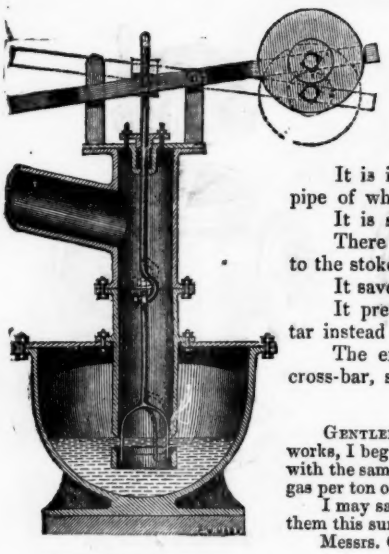
THORNCLIFFE IRON-WORKS, near SHEFFIELD.

CAFFALL, THOMAS, & CO., LIMITED.

PATENT IMPROVED SEAL

FOR

GAS HYDRAULIC MAINS.



It relieves the retorts from all pressure during the time gas is being made.

The end of the dip-pipe not being immersed in the tar, permits the gas to pass freely, and without pressure, from the retort into the hydraulic main.

The dip-pipe can be effectually sealed without trouble, to resist the back rush of gas, *to any possible pressure*, during the time of charging; but in the event of the Seal being left on, after the retort is closed, no inconvenience is caused, as the piece of pipe used as the Seal only lengthens it to an ordinary dip-pipe.

It is inexpensive, and can be easily and readily applied to any existing hydraulic main and dip-pipe of whatever shape or size, at a trifling cost.

It is simple in its arrangement, and cannot get out of order.

There is no deposit of carbon on the top of the retort, thereby saving considerable time and trouble to the stokers when drawing and charging, also the injury caused by scurfing the retort is avoided.

It saves 10 per cent. of the coal carbonized; also the same proportion of fuel, retorts, labour, &c.

It prevents the thickening of the tar in the hydraulic main, as the heated gas passes *over* the tar instead of being forced *through* it.

The extension piece of pipe is moved by a lever, from which hangs a $\frac{3}{8}$-inch rod, hooked on the cross-bar, so that the lid of the retort cannot be struck without first sealing the pipe.

Alton Gas and Coke Company, Alton, Hants, April 25, 1874.

GENTLEMEN,—In reply to your inquiry respecting your Patent Dip for Hydraulic Gas-Mains in use at these works, I beg to say that, upon looking into our carbonizing account for the last 12 weeks, and comparing the result with the same quarters of the past five years, I find that your Dip has given our Company an increase of 1286 feet of gas per ton of coals beyond the make in the other years, notwithstanding the retorts have been in use for three years.

I may say that our Company are so satisfied with the Dips that it is intended to fit up the other retorts with them this summer.

I am, gentlemen, your obedient servant,

Messrs. Caffall, Thomas, and Co., Limited, 28, Gracechurch Street. WM. TRIMMING, Secretary.

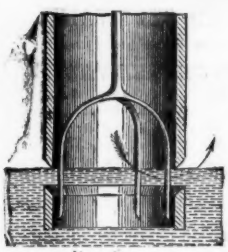


FIG. A.

Figure A shows the extension piece lowered to permit the gas to pass out of the dip-pipe without pressure.

Figure B shows the extension piece raised against the end of the dip-pipe, thereby preventing any back passage of the gas during the time of drawing and charging; and should it be left up while the gas is being made, no inconvenience is caused, *nor danger of bursting the retorts incurred; it being an open pipe and not a solid plug*, the gas will pass under as with the usual dip-pipe.

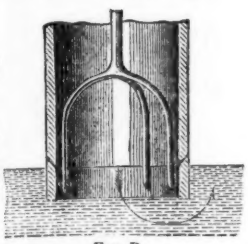


FIG. B.

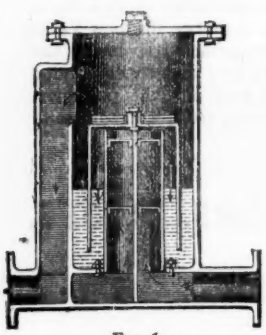


FIG. 1.

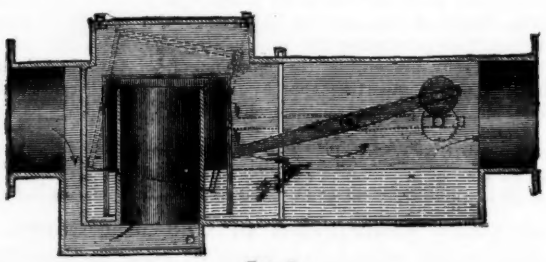


FIG 3.

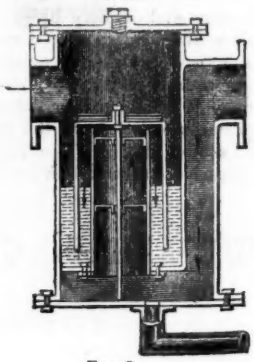


FIG. 2.

BYE-PASS FOR EXHAUSTER (Fig. 1).

This Hydraulic Bye-Pass has been invented for the purpose of supplying to gas companies a cheap, effective, and self-acting valve. It is simple in its construction, cannot get out of order, perfect in its action, can be made to stand any pressure, occupies very little space, and can be adapted to any existing pipes.

Fig. 2 is a Valve similar to Fig. 1, but made to act as a self-acting hydraulic bye-pass for washers, condensers, scrubbers, and meters; the Valve part being *below* the inlet and outlet, so that it may be applied to underground mains. Both Valves can be fitted to existing mains without disturbing them, more than the cutting out of a sufficient length to permit the fitting in of the Valve; after being properly fitted, they will require no further attention.

SELF-ACTING HYDRAULIC SAFETY-VALVE (Fig. 3),

For preventing the back flow of gas from the gasholder, and thereby preventing the possibility of accidents (the great damage and danger to life and property resulting therefrom) through the breaking of pipes, unsealing of purifiers, or any other cause. It is easy and prompt in its action, for upon the forward pressure of the gas ceasing, the bonnet *instantly* closes over the stand-pipe, thereby effectually preventing any return of the gas; no extra pressure is put upon any part of the works by its use, and it can be made to stand any required pressure.

Every information can be obtained, and Models seen, at the Offices of the Company,

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HOLMAN'S PATENT ECCENTRIC FASTENINGS & ANTI-FRICTION CATCHES.

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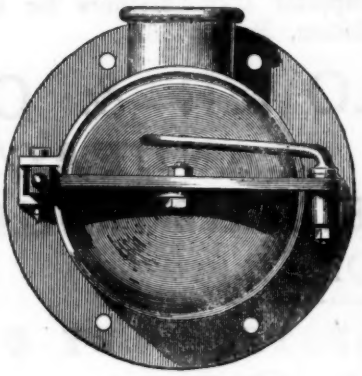
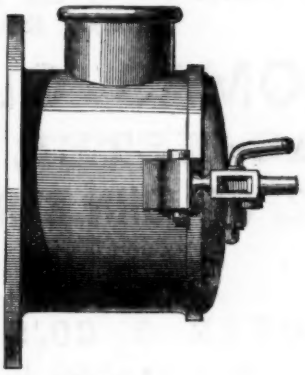
NO LUTING.

LIDS HINGED TO MOUTHPIECES; NO LIFTING ON OR OFF.

NO SCREWS FOR FASTENING.



FRONT VIEW.



SIDE VIEW.

SIMPLE.

ECONOMICAL.

DURABLE.

EFFECTIVE.

NO DUPLICATE LIDS REQUIRED.

These Lids are proved by many eminent Gas Engineers to be the most efficient, saving much time, labour, and expense; are opened and closed as quickly and with as little trouble as an ordinary furnace door, and by their use the Retorts are soundly sealed during the whole period of carbonization.

These Lids are Adopted by the following (among many other) Gas Companies:—

The Gaslight Company, Beckton (where over 2000 are in use).	The West Ham Gas Company.	The Salford Corporation Gas-Works.	The Carmarthen Gas-Works.
" Gaslight Company, Bow Common.	" Imperial Gaslight Company.	" Rochdale Corporation Gas-Works.	" Merthyr Tydfil Gas-Works.
" London Gaslight Company.	" Gas-Works, Arsenal, Woolwich.	" Liverpool United Gas-Works.	" Ystrad Gas-Works.
" Independent Gaslight Company.	" Commercial Gas Company.	" Birkenhead Gas-Works.	" St. Alban's Gas-Works.
" Phœnix Gaslight Company.	" Alliance and Dublin Gas-Works.	" Birmingham Gas-Works.	" Over Darwen Gas-Works.
" South Metropolitan Gaslight Co.	" Edinburgh Gas-Works.	" Nottingham Gas-Works.	" Aylesbury Gas-Works.
	" Manchester Corporatn. Gas-Works.	" Newcastle-on-Tyne Gas-Works.	" Cardiff Gas-Works.

The Morton's Lid is made circular in form, that being the most convenient and suitable shape. It can be used for Retorts of any section, by adapting the Mouthpiece casting from the D, oval, or other shape, at the back, to circular in front.

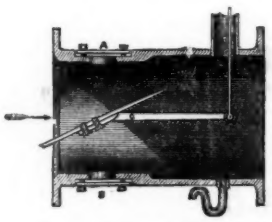
The following important Testimonial, among others, has been given:—

"*The Gaslight and Coke Company. Engineer's Office, 6, Westminster Chambers, Nov.* 14, 1871.

"Dear Sir,—In reply to your inquiry, I have the pleasure of stating that the whole of the Mouthpieces at Beckton have Morton's Lids attached to them and they have given us every satisfaction. We have 2160 in use.—I remain, yours truly, (Signed) "F. J. EVANS."

SOLE MAKERS OF

HUNT'S PATENT EQUILIBRIUM GAS GOVERNOR.



In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown at C on the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

The principal advantages of this arrangement over the ordinary form of Governor are as follows:—

Its sensitive action prevents oscillation.

It is self-adjusting—*i.e.*, it maintains a steady pressure under variations of inlet pressure or a fluctuating consumption.

The inlet to Gasholder being contracted to the smallest possible dimensions, all danger from leakage through insufficiency of seal, tilting, &c., is entirely avoided.

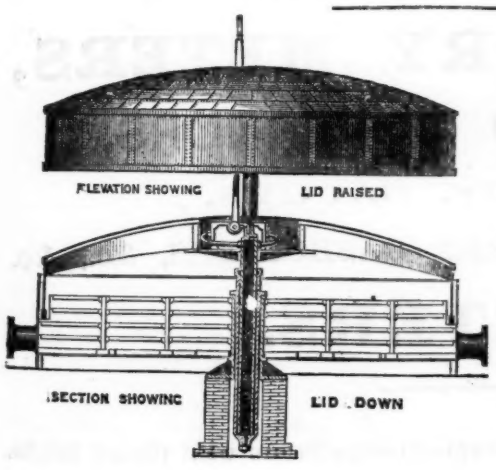
The valve portion being separate from the holder, it can be handled and fixed like an ordinary Slide Valve direct in the main; and the holder can be placed at any convenient distance immediately above it. The cost is thus materially reduced, and the inconvenience of heavy lifts done away with.

There are no working parts likely to get out of order.

These Governors have been adopted by several leading Gas Companies, among whom are the following:—

The Gaslight Company—a 24 in. at Whitechapel District Station.	The Gaslight Company—a 6 in. at the Gas-Works, Beckton.
" " a 36 in. at Goswell Road Station.	The London Gas Company—an 18 in. at the Gas-Works, Nine Elms.
" " a 24 in. at " "	" " an 8 in. at " "
" " a 24 in. at the Gas-Works, Beckton.	" " a 24 in. at " "

Also at the Gas-Works, Rochdale, Monmouth, Devonport, Cannes, and Mentone (France), &c.



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DIRECT HYDRAULIC LIFT

FOR PURIFIER LIDS

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SAFE, SIMPLE, AND DURABLE.

ANY SIZE LID MAY BE RAISED BY ONE MAN.

Eight Hydraulic Lifts have been applied at Beckton Gas-Works to raise the Covers of the large Check Purifiers, which are 40 feet diameter, during the past three years, with perfect success.

London 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865. Paris, 1867.

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The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

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1st, Are a remedy for all the defects of Wet Meters;
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3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

WILLIAM PARKINSON & CO.,

(SUCCESSORS TO SAMUEL CROSLEY,)

COTTAGE LANE, CITY ROAD, LONDON, E.C.

Established 1816.

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PATENT WET & DRY METERS,

STATION-METERS AND GOVERNORS,

PRESSURE REGISTERS, GAUGES,

EXPERIMENTAL METERS, PHOTOMETERS, GASHOLDERS, &c., &c.

WATER METERS.

W. P. & Co. beg to state that they are now prepared to supply Station-Meters with planed joints.

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THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JUNE 30, 1874.

Circular to Gas Companies.

We sometimes consider it a misfortune that we have to devote so much space to metropolitan gas affairs. At the present moment, however, no apology is necessary for once again recurring to the agitation going on in the metropolis against the London gas companies. The questions raised in the course of the debates involve matter of importance to every statutory gas undertaking; and, in fact, the existence of every statutory company may be said to be at stake, when it is asked what shall be done with the metropolitan gas companies. All are menaced when the legislative guarantees of any one are attacked. Not that, we are bound to say, any revolutionary notions have as yet been propounded in the London vestries, but demands grow in magnitude and importance when agitation is long sustained. Last week the delegates from the vestries held another meeting, and again separated without coming to a substantive vote on any of the questions submitted. The lack of what we may call business talent shown by this body of delegates gives us but a poor idea of the average vestryman. He appears to be rather ignorant, and more than rather opinionated; and but for the fact that there is a wise Providence which watches over the proceedings of vestries, and (with the assistance of a good clerk) guides them to sensible conclusions, we should have stronger doubts of the value of local self-government. There are, however, some talented gentlemen among those delegates; but not one has a definite proposal to make. The outcome of all these proceedings will most likely be an appeal to the Metropolitan Board of Works to initiate some legislative measure. One genius among them suggested that new gas schemes should be favoured, and said that gas evolved from chalk might be substituted for coal gas, as it could be produced at the low rate of 1s. 3d. per 1000 feet. He was promptly snubbed by another delegate, who said, with unquestionable truth, that chalk gas was a failure. Another suggestion was that parishes should combine and have gas-works of their own. Eight such establishments as that at Beckton, it was said, would be sufficient to supply all London. But the propounder of this scheme gave no estimate of the cost of these works, and, moreover, did not apparently realize the fact that, whatever the amount of money expended upon them, it would certainly be rendered unremunerative by the inevitable competition of the companies. We assume here that parliamentary sanction would be given to the competition; but we know that it would be withheld. There remains the purchase of the companies, from the idea of which the delegates seem to shrink with horror. And yet this is the only alternative; and if maximum dividends can be guaranteed to proprietors without the expenditure of a farthing of cash, we do not see why the Metropolitan Board should not at once embark in the purchase—we cannot call it speculation. There is no middle course. Referring to the debate at the Metropolitan Board, on Mr. Fowler's motion, reported to-day, we may say that the repeal of the Acts of 1868-9 is impossible. Their operation is, for the moment, disastrous to consumers; but that is the result of what we may call accident. Who that read the JOURNAL OF GAS LIGHTING can forget the song of triumph which the chairman of the Gas Committee of the Corporation of London recited on the passing of the City of London Gas Act, 1868; and Mr. Bontems was right at the time. It is useless to look back. That Act and those of the next year affected the value of an enormous amount of property, which has since changed hands, and the increased value was given by a legislative guarantee, not expressed in doubtful terms, but clear and explicit. It was to the effect that money invested in gas undertakings was entitled to the maximum dividend allowed by the general Acts, and this dividend was accordingly guaranteed. We give no opinion on the propriety of the enactment; we simply quote the fact, and remark on the change of value which took place in gas property, pointing out that the repeal of the Acts of 1868-9 would involve the confiscation of many thousands of pounds actually expended by innocent shareholders. We affirm, then, that the repeal of these Acts is impossible without some qualifying enactment. The present grievances of the gas consumers of the metropolis date from the passing of the districting Act, 1860. When Mr. Sotheron-Estcourt signed that map of London, the gas consumers may be said to have been passed over bound hand and foot to the gas company in whose district they found themselves. Competition in price or for supply was at an end, and yet undeniable advantages to the public have resulted. It may be taken as certain that if the districting had not taken place, combinations among the companies would have ensued, which, in the crisis through which we have passed, would have placed the consumer at a much greater disadvantage. There would probably have been a great combination on each side of the Thames, and we have no doubt that the price of gas would now have been uniform. As it is, the districting saved some in the price of gas, and it has saved the general public an immense deal of inconvenience in freeing the streets from continual disturbance. Newgate Market is now forgotten, or we would ask, did anybody, before 1860, see Newgate Street on a market morning without some portion being taken up? There were even more important thoroughfares in the metropolis which were incessantly disturbed on account of the number of gas and water mains passing under them. Those who would return to the days of unrestricted competition would do well to think over the public inconvenience which must result from the incessant disturbance of the roadways. Apart from that, there are abundant reasons why Parliament should not sanction competition. We put parochial authorities aside—they would never be allowed to spend money for the purpose; but anybody, even a vestryman, can see that unequal competition results in amalgamation, and that a "consumers" gas company can be quite as exacting as a proprietors. We shall wait for the report of the committee of the Metropolitan Board of Works with some curiosity. There are, to our minds, only two courses for the Board to pursue—either to purchase at a fair value or leave things alone, and allow time, which "levels all things," to remedy matters. We have said that the complete repeal of the Acts of 1868-9 is impossible: the return to unrestricted competition is equally impossible.

A paragraph has gone the round of the papers, stating that a proposal for lighting the Houses of Parliament and the public

offices with gas manufactured by the Government had been submitted to the First Commissioner of Works. We have no doubt the statement is quite true. Heads of Government departments are pestered incessantly with suggestions of the sort. We should be sorry to say how many people have tried to satisfy successive Prime Ministers that an enormous saving to the country might be effected if the Government wove their own red tape instead of buying it of a stationer. We venture to think that the Government will not start gas-works in the metropolis; and we know that, if they did, something quite other than a saving would result.

The Corporation of Ryde, we are happy to see, have not succeeded in defeating Mr. Thornton Andrews's claim for £194 5s. for professional services. They must now pay this and some other claims which have stood over pending the result of the proceedings in Mr. Andrews's case. The money, we presume, will have to come out of the pockets of the members of the Corporation.

A petition to wind up the Petersburg and Viborg Gas Company has been presented by the Patent Gas Company, and will be heard before Vice-Chancellor Malins on Friday next. It is likely that the proceedings will disclose some new phases in the management of the petitioning company.

The proceedings in the case of the Air Gaslight Company brought out nothing of general interest, except a report from Messrs. Wills and Pritchard, to the effect that the company is never likely to do any good. It remains now for decision, at another meeting of the company, whether or not the unpaid capital of £16,550 shall be called up, and sent after that already expended.

We continue to-day the publication of the papers read, and the discussions, at the meeting of the gas managers. Mr. Woodall's is a valuable communication on a very important matter, and will be read with much interest by practical engineers. In a future number we shall, by the kindness of Mr. Wyatt, be able to give plans of the Newcastle holder referred to in this discussion.

We must confess to having much confidence in the success of Mr. West's improved method and apparatus for manufacturing gas. There is no doubt that to obtain the largest amount of the richest gas from coal the essentials are a light charge of small coal, a sharp heat, and the rapid withdrawal of the gas from the retort. It is to be regretted that Mr. West was not able to give fuller details of the results of his workings, but the established gain of 10 per cent. in the production of gas is alone sufficient to recommend the process to the attention of gas companies. The mechanical arrangements we have no doubt save labour, and therefore expense, under that head, which is an important consideration. We hope that we shall soon have full statistical details of the results obtained by working the process on a larger scale.

We may be excused for saying a few words in commendation of a paper we publish to-day, read at a meeting of the Gaslight Association of the United States. It may be a consolation to some to know that gas companies are regarded with as much suspicion in America as here, and have the same difficulties to contend with. The remarks of the manager of the Buffalo Gaslight Company are admirable in spirit, and, it will be seen, accord with some observations made by the president of our own association.

WATER AND SANITARY NOTES.

Heavy storms, succeeded by genial showers, have been pretty general over the country, and have for the moment dissipated the fears of a serious drought which oppressed us. The rainfall, however, is still considerably below the average, and only a continuance of wet weather, not desirable in the haymaking season, can bring the plenty of water we want for domestic and manufacturing purposes. In several towns in Scotland the dearth is serious, and the most stringent regulations possible are being made for the prevention of waste; but the efforts of commissioners and water committees are not at all seconded by the general population, and a strict surveillance is found necessary. At Greenock the waste must be enormous, for as much as 67 gallons per head per day is supplied for domestic purposes. At Paisley the commissioners have found it necessary to prosecute several persons for wasting water.

The Ipswich Town Council have a proposal to purchase the water company under consideration. The company offer to sell the undertaking for £100,000 and 20 years purchase of the net revenue over £5000 for the year ending September, 1874. A committee of the council report in favour of purchase on these terms, supposing the Public Loan Commissioners will grant a loan of the purchase-money at 3½ per cent., the whole amount to be repaid in 50 years. The bargain looks, to our minds, a very good one; but Ipswich hesitates, and the Town Council have deferred coming to a settlement. They seem to be singularly undecided people in that borough. They want sewage-works, water-works, and gas-works, and cannot make up their minds on one single point.

Disclosures continue to be made of the frightful sanitary condition of some of our country places. The worst we have met with recently refer to parts of Herefordshire, which appear to have a thoroughly independent and competent officer of health in Dr. Sandford, and an efficient inspector. As usual, large landed proprietors are most at fault. It is right to say that the sanitary authority of Leominster well support their officers, and there is a prospect that the worst state of things will speedily be remedied.

Mr. Netten Radcliffe has recently visited Birmingham, Manchester, and other towns, to examine the pan and midden systems in use, and to report on the general sanitary arrangements of these places. We may expect an unmitigated condemnation of everything but a water-closet, and some recommendations involving no little expense to the towns visited. The Local Government Board is at this moment showing great activity in sanitary matters. The Sanitary Laws Amendment Bill brought in by the Board has been read a second time; but as yet no discussion has taken place on its provisions. Probably the skeleton of the Bill was found in a "pigeon-hole" when the now President of the Board took office. We have not had time to give an attentive study to its provisions, but a cursory glance shows that they confirm boards of guardians in their position as the sanitary authority in rural districts, giving them wider powers and increased responsibilities under stringent central control. Mr. Michael, in his pamphlet referred to before, points out that the destitution authority failed to be efficient under the Nuisances Acts, and yet he says, "We find them suddenly called upon to superintend the whole of the sanitary regulations of the rural portion of the empire." Will they prove more efficient in this work? Time alone will show; but our fear is that the duties and responsibilities of a guardian will be made so onerous, that the office will be shirked by all but designing men. Among the new powers conferred, we notice one which will enable the sanitary authority to close a private well reported to be polluted, and the water dangerous to health. There is another clause which will subject a lodging-house keeper to a month's imprisonment with hard labour, or a fine of £20, for giving an untruthful answer to the question—Has there been any contagious or epidemic disease in your house during the last three months? This is rather hard on the seaside lodging letter, who would not be more to blame than the anxious parent who took into the house a child convalescent from scarlet fever, and carefully concealed the nature of the disorder from which it was recovering.

Correspondence.

TARRY MATTER IN GAS.

Sir,—If your correspondent, R. R., finds his condenser not equal to the duties required of it, I would advise him to erect a scrubber suitable to the size of works under his control—say, for 4 inch or 6 inch connexions, 4 feet diameter by 12 feet in height, circular in form, and fitted with three or four trays or sieves, covered to a depth of 8 inches with coke, or other equally good material. Between every tier he must provide a man-lid, for the half-yearly cleansing operation; at the bottom a syphon-pipe, for carrying off the products of condensation; on the top a cistern, to contain the ammoniacal liquor for scrubbing purposes, and in capacity equal to a six-hours supply, it may either be placed immediately above the apparatus, or at a convenient distance off. The stream of liquor to be regulated by a stop-cock, according to the quantity at disposal, and be as free from tar as it is possible to make it. Now, let me impress upon R. R.'s mind the importance of simplicity in the construction of the distributing apparatus; therein lies the secret of successful working. It would be no exaggeration to say that 50 per cent. of the scrubbers in works throughout the kingdom are at this moment inefficiently performing their duties. Why? Because they are fitted up internally with "distributors" specially designed to give the *least* amount of satisfaction and the *greatest* amount of trouble; it is, nevertheless, true—too true, as hundreds of managers and foremen can testify. R. R. must be careful in selecting the proper kind of "distributor." Give a wide berth to those "fearfully and wonderfully" made, and whatever he does let it be a source of profit and pleasure, instead of, as it is too often the case, a source of loss and grief. One word in conclusion. Should R. R. find a new cast-iron scrubber too expensive, I would recommend him to look out for a second-hand Cornish or locomotive steam-boiler; they answer the purpose exceedingly well, and have one advantage—viz., cheapness, a consideration in these dear times.

Black Rock, Brighton, June 25, 1874. James Robb.

OBLIGATIONS OF GAS COMPANIES.

Sir,—Will you kindly allow me, through your valuable Journal, to ask if any of your numerous readers can inform me if a gas company can refuse, and if so, under what Act of Parliament, to supply gas to a house or premises when they consider the interior pipes too small for the number of lights required?

I have had several of these cases lately, and, consequently, complaints of bad gas, &c., the sole cause of which has been found to be from persons employing inexperienced fitters in fitting up their establishments.

A Country Manager.

A TREATISE ON THE SCIENCE AND PRACTICE OF THE MANUFACTURE AND DISTRIBUTION OF COAL GAS.

XIX.

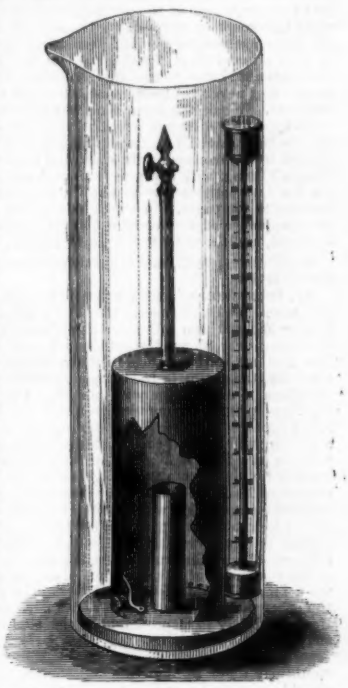
The account of coal would be incomplete without a description of the means employed to ascertain the heating power of this and other fuels; but as this part of our subject possesses but scanty interest for gas makers, it will be dealt with briefly. In the following description the term "units of heat" will be frequently employed, and it will be best to explain at the outset what is meant by a "unit of heat." It is *the amount of heat required to raise one pound of water one degree Fahrenheit.* Several experimenters have devoted a great amount of labour to ascertain the heat evolved in the complete combustion of various substances. Their results are not concordant. For example, to quote only those most nearly agreeing, we have the results of Favre and Silbermann, who determined that the combustion of one pound of hydrogen raised 34,662 lbs. of water one degree of Fahrenheit—in other words, evolved that number of units of heat—and the determination of Dr. Andrews, who found that 33,808 lbs. was the correct number. Similar differences occur in the determinations of the heating power of pure carbon. We adopt, however, the results obtained by Dr. Andrews, which, from the rare skill and conscientiousness of the experimenter, may be taken as the most reliable. Dr. Andrews found that the number of units of heat evolved in the combustion of pure carbon is 7900. With those data before us, and having an ultimate analysis of a coal or coke, it is easy to calculate the *theoretical* heating value. If, for example, we take the first on the list, given at page 728, a coal containing 86·81 per cent. of carbon, 4·96 per cent. of hydrogen, and 5·22 of oxygen. Here the value of the carbon in the coal is found by the following calculation: $\frac{86{\cdot}81}{100} \times 7900$, which gives 6758 as the number of units of heat. In estimating the value of the hydrogen, a deduction has to be made of the amount required to combine with the oxygen of the coal to form water. This is found by dividing the amount of hydrogen by 8, the combining proportion of oxygen: $\frac{4{\cdot}96}{8} = 0{\cdot}65$, and this subtracted from 4·96 leaves 4·31 as the quantity of hydrogen available for the production of heat. According to the determination of Dr. Andrews, given above, the value of the hydrogen may be calculated as follows: $\frac{4{\cdot}31}{100} \times 33808 = 1457$, which is the heating value expressed in units. The two numbers $1457 + 6758 = 8215$, which is the theoretical heating power of the coal.

In the absence of an ultimate analysis, however, there are other methods of arriving at the heating power of a coal or coke. One has been devised by Berthier, and consists in ascertaining the amount of oxygen necessary for the combustion. This is arrived at by mixing the coal or coke, in a very fine powder, with a substance containing oxygen, which is not expelled by heat, but which, at a high temperature, readily combines with a substance like carbon, having a strong affinity for it. The substance best adapted for the experiment is pure litharge (oxide of lead). A given weight, say 20 grains, of the finely divided and dry coal is intimately mixed with 40 times its weight of litharge, and the mixture is then placed in a crucible, and kept for some time in a state of fusion. When the crucible has been allowed to cool, and the contents are broken up, a button of metallic lead will be found, from the weight of which the amount of oxygen withdrawn from the litharge, and used in the combustion of coal, may be easily calculated. It is not necessary, however, to make this calculation. When pure carbon is employed in the experiment, it is found that the weight of the lead reduced is 34·5 times that of the carbon used. In the case of any fuel which yields a less amount, "the following ratio will give the heating power—namely, as the metal obtained when operating with pure charcoal is to that reduced by the substance under experiments, so is the number expressing the units of heat of carbon to that of the fuel." Thus, supposing the sample to give 20 times its weight of lead, the heating power

$$x = \frac{20 \times 7900}{35{\cdot}5} = 4580.\text{"}*$$

This experiment is scarcely to be depended upon in the case of a coal, especially if it contain much hydrogen. It is more to be relied upon with coke and charcoal; but at best gives results only approximating to the truth.

Another mode of estimating the heating power of fuel is that devised by Mr. Lewis Thompson, to whom gas manufacturers are indebted for much valuable information. The experiment consists in deflagrating a given weight of fuel in a known weight of water, which is, of course, thereby raised in temperature, the number of degrees on Fahrenheit's thermometer showing the evaporative power of the fuel. The principle on which this calorimeter is constructed is very simple, and the ingenious use made of it reflects the highest credit on the inventor. The latent heat of steam being 967° Fahr., it follows that if 967 parts of water be heated 1° Fahr., as much heat has been employed as would have boiled off one part of water from 212°. If, therefore, one grain of coal is burned in the midst of 967 grains of water, the degrees of temperature acquired by the water will show the number of grains of water which the fuel is able to convert into steam, and substituting the word pounds for grains we have the evaporating power. It is better, however, to employ more than one grain, and the quantity recommended by the inventor is 30 grains, which is therefore to be burned in 29,010 grains of water. The apparatus figured* is designed for this quantity. It consists of a tall glass vessel to hold the water; a copper tube, closed at one end, about 3 inches long and 0·8 inch wide, to contain the deflagrating mixture; and a condenser made of thin sheet copper, about 6 inches high and 2 inches wide, to the upper end of which a capillary tube is fixed, furnished with a stop-cock. The lower part of the condenser is pierced with holes, and is made to fix on a disc of brass, which serves as a support for the furnace. For the use of the instrument the following instructions are given:—



An average sample, say 200 or 300 grains, of the coal or other fuel to be tested, should be reduced to a very fine powder in the following way:—Triturate the fuel in the iron mortar, and, when partly reduced, separate the coarser particles from the completely reduced portion by means of the hair sieve, the latter portion being caught on a sheet of paper. Return the coarser particles to the mortar, triturate again, sift, and so on, until the whole mass has been passed through the meshes of the sieve. Intimately mix the powdered fuel.

Exactly 30 grains of this powdered fuel must be intimately mixed with from 10 to 12 times its weight of a mixture composed of three parts of chlorate to one part of nitrate of potash (usually called oxygen mixture), which must also have been reduced to a fine power by the aid of the pestle and mortar and the hair sieve, and be, when mixed with the fuel, perfectly dry, for if the oxygen mixture be at all damp, the experiment will fail. When the intermixture is seen to be complete, the resulting grey powder is to be carefully introduced into the narrow copper furnace and compressed down in successive portions, by tapping the bottom of the furnace on a table.

The furnace is next placed in its seat on the brass base, and a hole made in the mixture to receive the fusee (half an inch in length), which is fixed by pressing the mixture round it.

The glass cylinder being charged with 29,010 grains of water, the temperature is noted by a delicate thermometer, and this being withdrawn, the fusee is lighted, and the condenser (with its stop-cock closed), is fixed over the furnace, the springs of the base clasping the sides of the condenser. The whole apparatus is now to be submerged in the water of the cylinder.

This operation must be performed quickly, and before the fusee ignites the mixture, or the whole will be consumed in the air, and the experiment destroyed, besides some danger of burning the hands and face of the operator.

The temperature of the water employed should be about 60° Fahr. at the commencement of each experiment, and must be first determined by immersing the thermometer for a few minutes.

When combustion ceases the stop-cock is to be opened, and the condenser moved gently up and down, which causes the fluid within and without the condenser to acquire the same temperature. As little time as possible should elapse after conclusion of combustion before determining the increased temperature of the water.

Attention should be paid to the state of the exit-tube of the condenser, at the conclusion of each experiment. If, on opening the stop-cock, air does not freely issue, a pointed wire must be introduced to clear it.

As part of the heat generated by the coal is absorbed by the instrument, this per centage heat, which averages 10 per cent. of the observed effect, must be added to every calorific result obtained.

In testing coke, anthracite, or other difficultly combustible substances, a wide furnace must be used, and the mixture may be allowed to remain loose and uncompressed in the furnace; but in the case of coal a narrow furnace is required.

* Muspratt's Dictionary, vol. ii. p. 108.

* Made by Alex. Wright and Co., Millbank.

Legal Intelligence.

VICE-CHANCELLOR'S COURT.—SATURDAY, JUNE 20.
(*Before Vice-Chancellor* HALL.)

In re THE AIR GASLIGHT COMPANY.

Mr. DICKINSON, Q.C., said in this case there were two petitions for winding up the company—one presented by the directors, and one by the shareholders. He appeared to support the former, the petition being presented under these circumstances. The company had carried on business for some time, and the object of the company was, in effect, to work an invention of a Mr. Harrison, which was to be a great improvement in the manufacture of gas, differing from the ordinary coal gas. The invention was supposed to be a very clever one, the business had been carried on for some time, but the case made by the petition was, that it had never been carried on at a profit, and from the peculiar circumstances of the case must be carried on at a loss. One of the principal features in the case was the necessity for the use of a particular liquid—paraffin or a preparation of petroleum oil—in consequence of which the affair could not be carried on at a profit. When the case was before the court last the petition was vigorously opposed by Mr. Harrison and a number of gentlemen who took the same view as he did, and ultimately his honour directed that a meeting of the shareholders should be held, that the state of the company should be laid before them, and that they should determine what should be done. Accordingly that was done, and at that meeting a committee was appointed to look into and report upon the result of their investigation. That report was to be made within three months, which three months expired at the end of April. The meeting also desired that the petitions should be dismissed with costs, but he thought that was for his honour to determine, and not them. After that resolution for the appointment of a committee had been come to, and the committee had been appointed, Mr. Harrison and his friends on more than one occasion had caused the petitions to be restored to the paper, asking that the petitions should be

dismissed. His honour on those occasions had said he could not accede to that request to dismiss the petitions, because as the shareholders had appointed a committee to report upon the state of affairs, he must wait until the report was made. The committee then proceeded with their investigations, but being unable to make their report within the specified time, a meeting was held, at which the time was extended for three months—till the end of July. In the meantime Mr. Harrison, the inventor (who was by far the largest shareholder, by reason of the purchase-money being paid in fully paid-up shares), and his friends had succeeded in getting themselves appointed as directors of the company. The committee, in the course of their investigations, had consulted two gentlemen skilled in the matter—Professor Wills and Mr. Pritchard—to inquire into the advantages of the particular scheme which was to be so profitable as to make the company successful. Those gentlemen had made a report, apparently not quite a satisfactory one to themselves because they alluded to the shortness of time allowed them for the purpose, which report had been presented to the committee, and also to the shareholders. The report to be made by the committee had never yet been made, although one had been made by some of the members. What had been done was this—these gentlemen said we who have been appointed directors are also members of the committee of investigation, and we have resolved that we as members of the committee of management, be merged into ourselves as directors, and then as directors, who have opposed the thing all along, will apply to the court asking that the petitions be dismissed. On the last petition day an application was made *ex parte* for the case to be restored to the paper, when both he and Mr. Lindley objected to its being heard in consequence of the report not having been made, and his honour's directions observed, and therefore it stood over until to-day.

Mr. GREENE, Q.C., said it stood over because his friend wanted time to answer the affidavits.

Mr. DICKINSON said such was not the case. But, however that might be, the case now came on in exactly the same condition—the conditions imposed by his honour had not been fulfilled. His friends on the other side had filed affidavits extending over 15 brief sheets, which he would call his honour's attention to. The first affidavit was made by Mr. Harrison, the gentleman who practically controlled the voting in the company, and stated that he was the patentee of the machines in conjunction with his son. The affidavit stated that a petition for winding-up the company was presented and heard on the 16th of January, 1874, being opposed by himself, and was ordered to stand over for the directors to call a meeting and ascertain the wishes of the shareholders. That such meeting was held on the 28th of January, at which a committee of seven was appointed to investigate the accounts and ascertain the value of the company, and also requesting that the petitions be dismissed with costs. That the petitions were brought on again, but were ordered to stand over by his honour until the committee had made its report. On or about the 12th of May, 1874, an extraordinary general meeting was convened for the purpose of extending the time for making such report, and that such extension was granted. At the meeting the chairman of the committee of investigation placed before the meeting the first report of the committee as to the practicability of the patents and invention, which was to the effect that the company possessed a property capable of successful application, and likely to be profitable to the shareholders if properly managed. The shareholders at such meeting were perfectly satisfied from the reading of the report that the inventions and patents were *bonâ fide*, and, if properly managed, would pay them in the end, and thereupon they proposed that the directors should resign and new directors be appointed in their place, but in consequence of the meeting being called for an express purpose such resolution could not be put. Thereupon a requisition was handed in to the directors to convene an extraordinary general meeting for the purpose of electing new directors, and such meeting was held on the 2nd of June, when the shareholders present expressed themselves satisfied with the result of the examinations made by the committee of investigation, and a resolution was almost unanimously carried, calling upon the directors to retire, and, on their so doing, a new board of directors was there and then appointed, and by the said resolution power was given to the committee to be merged into directors. Several board meetings have been held by the new directors, who have expressed themselves satisfied of the practicability of the invention, and a number of testimonials had been received from persons using the invention. Several shareholders had stated their willingness to pay their calls if the petitions were dismissed, but only upon that condition, and the orders that had come in were only in the event of the petitions being dismissed, because if persons took machines and then the company was wound up, they would be utterly valueless. The loss already sustained by the company, by reason of the petitioners hanging over the company's head, was estimated by Mr. Harrison at £5000; and the shareholders were greatly damnified by the petitions remaining on the file.

The VICE-CHANCELLOR inquired whether there was anything before him at all in the nature of a report.

Mr. GREENE said there was the report of the committee.

The VICE-CHANCELLOR asked whether any resolutions were founded upon it.

Mr. GREENE replied in the negative.

The VICE-CHANCELLOR said then part of the object for which the case had been adjourned was not yet attained.

Mr. DICKINSON said his honour would understand that the affidavits which had been filed were not his; and he should ask that the gentlemen who *ex parte* caused the petitions to be restored to the paper, and gone to an idle and unnecessary expense, should pay the costs of all the affidavits.

The VICE-CHANCELLOR said there was another view in which to look at it—viz., if the case was to be gone into he might have to deal with the original petition, and if he was not satisfied that there had been a report made which the court could act upon, and the case was pressed on, he should deal with it at once.

Mr. GREENE said upon the last occasion when the case was before his honour it was ordered to stand till that day.

The VICE-CHANCELLOR said he was aware of that, but the directors had asked that it might be put in the paper. What he meant was this, that the case being in the paper that day, rightly or wrongly, and Mr. Greene's clients insisting that it should proceed, if he was not satisfied with the report, which had been made, it might end in an order being made to wind up the company.

Mr. W. W. KARSLAKE said he hoped before that was done that his honour would hear him. He was instructed on behalf of the company—the new directors appointed on the 2nd of June and the committee—to oppose the petitions in every possible way, and to ask that they be dismissed.

The VICE-CHANCELLOR said he might have a very good case for asking that, but the new directors had taken the course of coming into office pending certain proceedings directed by the court to be taken, which had not been taken, and therefore Mr. Karslake would have to satisfy him why that had not been done.

Mr. KARSLAKE said he would satisfy his honour that it had been done.

Mr. LINDLEY, Q.C., said he did not quite understand how Mr. Karslake could appear for the company and oppose the petitions, when the company on the last occasion appeared and agreed to be wound up.

Mr. KARSLAKE said he was aware of that, and could give a complete answer.

Mr. GREENE said the pendency of the petitions was injurious to the company, they having been pending since last January.

The VICE-CHANCELLOR said he was aware of that. But having required a certain thing to be done he wanted to know why it had not been. If he was right in his recollection of what took place before, what was directed, among other things, was that something clear and accurate in the way of a statement of assets and liabilities should be presented, and he should like to know whether that had been done.

Mr. GREENE said no such order had been drawn up, but that was what was directed.

Mr. KARSLAKE read an endorsement on his brief showing that such was the fact.

The VICE-CHANCELLOR said he wanted to ascertain what the debts were.

Mr. KARSLAKE said there was only one debt owing by the company of £15 to the stationer, and the assets consisted of £16,550 10s. of unpaid capital on the shares issued, all of which was good, the doubtful ones having been struck out.

The VICE-CHANCELLOR asked why he could not have a proper report, and a proper meeting held, and the result of that meeting communicated to the court.

Mr. DICKINSON said he would show why not. The company did not intend that kind of thing to be reported upon by the committee. It did not require any reading from counsel's briefs to state what was the object of the petitions standing over. There were two petitions presented to wind up the company; they were ordered to stand over that the court might be in possession of sufficient information to determine that question. Then Mr. Dolman had made an affidavit on the 11th of June, in which he stated the fact of the appointment of a committee of which he was the chairman, and that the committee, in the course of their investigations, discovered that fresh patents had been taken out by Mr. Harrison since the commencement of the business of the company, in extension of their property, the principle of which the committee deemed it right to inquire into. As the time for making their report had expired, an extension of time was sought, and three months further time obtained. It then mentioned that a resolution was passed calling upon the directors to retire, that they retired accordingly, that new directors were appointed, who passed a resolution that the petitions ought to be dismissed, inasmuch as in their opinion they were presented without proper consideration, and within a few days of the time when the general meeting ought to have been held. It then referred to the injury which would happen to the company if the petitions were not dismissed. Mr. Dolman had made another affidavit, filed on the 16th of June, in which he stated that he was the chairman of the present board of directors of the company, and also verified the report made by some of the members of the committee. Having that statement in the affidavit, he would come to the report itself, which was not a report of the committee, but of certain members only, because when made there were only three out of the seven present. The report was to the following effect—That certain members of the committee whose names were appended had declined to make any report, other than such general explanations as were offered by the chairman at the meeting on the 12th of May. Learning, however, that the Vice-Chancellor considered it incumbent upon them to make a report, they proceeded with the intestigations, and got the assistance of Professor Wills and Mr. Pritchard, who had made a report, stating that on receiving instructions on Tuesday, the 17th of March, they proceeded to make the proper investigations with regard to the patents taken out by Mr. Harrison, and had found them all to be one and the same thing. The patents described various methods for the performance of the operations, but greater value was, however, placed on the fourth patent, and it was with the apparatus described in that patent that their experiments were made and their conclusions drawn. The report then stated the various experiments which had been made.

The VICE-CHANCELLOR: Had we not better go to the conclusion?

Mr. DICKINSON said the report stated that 4½ gallons of the spirit was required to produce 1000 feet of gas, and the cost of the spirit is stated. They believe the spirit used is as good as can be required, and they consider the special apparatus brought under their notice to be as good as any in use, but still falling short of what might be required. They had no doubt that the air gas produced, which was free from the ordinary impurities of coal gas, was capable, under suitable circumstances, of successful application; but they would, however, point out the limited field of application which, in their opinion, was before any process for the production of air gas. In no case would it be possible for any such process to compete with coal gas, and they believed it would only be applicable in cases where expense became a secondary matter. The report concluded by saying that as the time at their disposal was short, the means at command limited, the investigations had not been so full and complete as perhaps under other circumstance would have been desirable. That being the report of the experts to the committee of investigation, the committee reported that the report made by Messrs. Wills and Pritchard must have been of an incomplete character, because they had since discovered that another patent had been taken out since the formation of the company, to which the company was entitled, and which they wanted to value, and to do this their power was enlarged. "Your committee submit that although the report of Messrs. Wills and Pritchard is not so encouraging as could have been desired, still they think that the patents might be worked profitably; that they are encouraged in this conclusion by the fact that Mr. Harrison, the patentee, who holds shares to the amount of£ 65,000, renounces his claim to receive a dividend until the other shareholders have received 10 per cent." That report was signed by the committee, except three gentlemen, the reason for their not signing being that one, having become a director of a rival company, was asked to retire, which he did; another from ill health, who had not attended the meetings; and the third in consequence of being abroad. Thus the committee only set out the statement of the two scientific gentlemen, in which the material question of the financial part of the subject is a matter they laid before the committee for careful consideration, but to which the committee have paid no attention. The four gentlemen who signed the report called attention to their own incapacity to make a report, because they stated "the report was of an incomplete character." Anything more ridiculous than to suggest that that was a proper report of the committee was hardly possible to imagine, because the report required by the court was one as to the assets and liabilities of the company, so as to enable his honour to determine whether the company should be wound up or not. He considered they had not advanced one jot from where they were on the last occasion except this, that there was an invention which seemed to be a clever invention. They had not the result of the meeting of shareholders communicated to the court, except that a committee had been appointed, and that their time had been extended in which to make their report. The new directors chose to come *ex parte* and ask to have the petitions restored to the paper, without bringing anything before the court except what was present on the last occasion, which he submitted was a waste of money, and that they ought to pay the costs.

The VICE-CHANCELLOR said that the report, upon the face of it, stated that explanations had been given at the meeting of the 12th of May, to the effect that they were not then in a situation to make a satisfactory report. What was to be done?

Mr. GREENE said they had examined the last patent obtained by Mr. Harrison since then.

The VICE-CHANCELLOR said they stated they were still not in a position to make a satisfactory report.

Mr. GREENE said what the committee stated was that any such report as they deemed it their duty to make in accordance with the terms of the resolution must be of an incomplete character, inasmuch as the chairman had explained at the meeting of the 12th of May, that they had, after obtaining the report of Messrs. Wills and Pritchard, learned that another patent had been taken out, the property of which they were entitled to, and they desired an opportunity of testing the nature of the invention, and for that purpose their powers were extended.

The VICE-CHANCELLOR said that had never yet been done.

Mr. GREENE said that the patent had since been examined, and they stated they had good ground for believing that the inventions, taken together, might be so worked as to make a fair return.

The VICE-CHANCELLOR said the committee went on to deal entirely with

what they considered the result of the report of Messrs. Wills and Pritchard, which was dated in April, 1874, and they based what they said entirely upon that report.

Mr. GREENE said they considered the invention and report together, and thought the invention could be worked profitably. He did not know what the committee could do further, for they had exhausted their power completely, and did not even talk of making a second report.

The VICE-CHANCELLOR said he did not see anything stated on the face of the report to lead him to the conclusion that the further point had been taken into consideration.

Mr. DICKINSON said nor the question which Messrs. Wills and Pritchard particularly referred to.

Mr. GREENE said they desired an opportunity of testing the nature of the invention, and including in their report any opinion upon its value, and, in order to enable them to do this, the time was extended by the meeting of the 12th of May, at which time the old directors were deprived of their position, and new directors appointed in their place. The great difficulty had been made by the old directors, who presented the petition, and it was monstrous to have that impediment in the way of a flourishing concern. Those directors were displaced by the meeting of the 12th of May, which had before it the report of Messrs. Wills and Pritchard. Having done that they put in their place new directors, who now appeared by Mr. Karslake, and they had come to the conclusion that the thing ought to go on, and asked that the petition should be dismissed. Why should there be any delay. It seemed to him that a concern with litigation going on from January to June could hardly prosper.

The VICE-CHANCELLOR said that there had not been a meeting to consider the last report.

Mr. GREENE asked why there should be. It would come to the same thing, because the meeting of the 12th of May had expressed itself, knowing what the report of Messrs. Wills and Pritchard was.

Mr. KARSLAKE said that at the meeting of the 28th of January a poll was demanded upon the question whether the petition should be dismissed or not, and that poll was held on the 3rd of February, when there were 1241 for the dismissal and 543 against, the majority for the dismissal being 698. At the meeting on the 12th of May, held for the purpose of extending the powers of the committee, his honour had heard a requisition was made by shareholders for a special meeting to depose the directors. That meeting was held on the 2nd of June, and at that meeting a proposal was made that it should stand adjourned till the 23rd of June, in order that the committee of investigation appointed at the meeting of the 28th of May should make their report to the company of the value and prospects of the patent, the manner in which the company was promoted, and how the money had been expended. That was put to the meeting and lost. The directors then retired, and new directors were appointed, and the report which Mr. Dickinson had read was the report of four out of seven members of the committee. The three others were fully accounted for. One had become a director of a rival company, and it being represented to him by the committee that it was undesirable he should continue a member of it, he acceded to that and retired. Another was unable to attend from illness, and the other gentleman was abroad. At the meeting on the 2nd of June it was resolved that Messrs. Dolman, Abbott, Gray, Harrison, and Wood be appointed as directors, and their fees were reduced to £2 2s. to the chairman, and £1 1s. each to the directors for their attendances, and the services of these gentlemen as members of the committee should be deemed as merged in their office of directors. It had been said that the resolution was a resolution of the directors themselves or of the committee, but that was not so.

Mr. DICKINSON said the meeting was not held for that purpose.

Mr. KARSLAKE replied it so happened that three out of the four gentlemen who signed that report were members of the new board of directors; Mr. Desmond the other gentleman was only a member of the committee, so that they had four out of the six, and the other two were accounted for as not having signed.

The VICE-CHANCELLOR said it appeared to him that that report having been made, as it had been made, without saying whether it was a complete, sufficient, or satisfactory report, it appeared to him it ought to go before a meeting, and that they should consider it. That report might induce some who were at the meeting before probably to change their views. They would see the report, and he did not think the sense of the meeting had been taken in the way which he expected it to be. That was upon the merits of the scheme itself, but upon the other parts of the case he had not heard anything yet, except generally what he had been told by Mr. Karslake as to the financial position of the company.

Mr. KARSLAKE said it was true the report was not read at the meeting of the 12th of May, but what was done was, Mr. Dolman, the chairman of the committee, who was now appointed chairman of the company, made a full statement to the meeting of the state of affairs; that was entered in the minutes of the general meeting, signed by the chairman, Sir John Murray, and the shareholders had before them at that meeting the substance and essence of what was now in writing before the court. With that information before them, the requisition was made by certain shareholders then present at the subsequent meeting on the 2nd of June to depose the directors, who had been the supporters of the petitions in January last. The petition upon which Mr. Dickinson appeared was presented by the gentlemen who at that time filled the office of directors of the company, not *quâ* directors, but *quâ* shareholders.

The VICE-CHANCELLOR intimated that it was not necessary for Mr. Karslake at the present stage to go into that matter.

Mr. KARSLAKE desired to say that at the meeting of the 12th of May last the shareholders then having before them the information which his honour had, came to the conclusion that those directors should retire. The meeting was of the same opinion as it was in February—namely, that the petitions should be got rid of as being the only obstacle to the success of the company. The subsequent meeting was held on the 2nd of June, and at that meeting a proposal was made that the meeting should stand adjourned till the 23rd of June, in order to have a written report from the committee; that proposal was put to the meeting, and, being put, was lost. Therefore he ventured to put it as strongly as he possibly could, on behalf of the new directors, that at that meeting the shareholders expressed their opinion in unmistakeable terms that the company should be permitted to go on, and should be no longer embarrassed by the delays which had taken place, hindering it from taking orders which could be received to-morrow morning, supposing the petitions were got out of the way. For instance, there was every probability of making an arrangement with the Metropolitan District Railway. A handsome offer also had been made from Manchester for machines for mining agents there, for about £1000. But those orders could not, and would not, be given so long as the petitions were pending. It was ruining the company to have any further adjournments. That was the reason why application was made to have the petitions restored to the paper. It was a gross hardship upon the shareholders of the company that their money should be squandered, and that they should have the petitions hanging over their heads, the principal of them, at any rate, being at the instance of the directors, whose duty it was to support the company, and see what could be got out of it for the shareholders. Those petitions were presented by the directors one week before the day at which the ordinary annual meeting would have taken place, in order to stop the mouth of the company. As soon as the shareholders had an opportunity of expressing their opinion they did so, and, as he had said, by an overwhelming majority decided that the company should go on, and they were of that opinion still.

The VICE-CHANCELLOR said it appeared to him that the report, which was now brought forward in aid of the case, presented to the court for discussing the petitions, having been made, it ought to be submitted to a meeting. But he thought it would be much to be lamented if, in submitting it to a meeting, there could not be something said, with reference to the new invention or patent which was said to have an important bearing upon the matter, favourable to the company's going on; that was, for those who supported the company being allowed to go on to see whether they could get some additional report to fortify the case. As to that it would be for them to judge. There was a considerable extension of time with reference to that, no doubt, to give the gentlemen a further opportunity of examining into the matter. For the purpose of the further meeting, which his honour thought ought to be held to put the matter beyond doubt one way or the other, as to the sense of the shareholders upon the subject, he did not desire that it should be deferred, except for as short a time as possible, and that the meeting should be held forthwith, the object and purpose of the meeting been shown expressly upon the circular which convened the meeting. What time was proposed for that? because he should be very glad to have it disposed of.

Mr. GREENE said the case had been most unfairly represented to the court, as regarded the financial position of the company.

The VICE-CHANCELLOR said he had not gone into that part at present, and even if it were gone into, he did not think, if he were satisfied upon that part, he should be disposed at once to deal with the matter without the report being communicated to the meeting which he thought ought to be held.

Mr. GREENE said if his honour came to that conclusion, it was no use drawing attention to the financial condition of this concern; but the old directors, who had caused all this obstruction to the working of the concern, had debited the company with nearly £4000, which ought to have been paid by the gentleman who undertook to form the concern, and was paid for doing so. That was one instance. Then there were the salaries of the directors, which were enormously high. The new directors came in and said they were content to take a much less salary, and they had resolved, by a meeting of the general body of the shareholders, that the directors should be paid £2 2s. for the chairman's attendance and £1 1s. for the others.

The VICE-CHANCELLOR asked if there would be any difficulty in having the meeting held on Wednesday next, so that it could be in the paper next Friday.

Mr. DICKINSON said practically he feared there would be, because on the last occasion when the matter was before the court it was determined that there should be a meeting convened as early as possible, and it was found that seven days notice was required to be given.

Mr. GREENE said that would bring them to that day week.

The VICE-CHANCELLOR said it must be held as quickly as possible.

Mr. GREENE said the petitions must be heard as soon as possible after the meeting.

The VICE-CHANCELLOR said so they should be, they would be in the paper on Friday, and must be disposed of.

Mr. GREENE said he should not ask his honour to disturb the paper for them. They might be put after motion on Thursday week.

Mr. LINDLEY said he should like to understand if anything was to be submitted to the meeting more than the report, or whether there should not be some statement of the financial position. They were quite in the dark.

The VICE-CHANCELLOR said Mr. Karslake's clients must take care of that.

Mr. LINDLEY said the shareholders ought to be informed of the financial state of the company, its assets and liabilities.

Mr. KARSLAKE said the liabilities were *nil*, the assets £16,510.

Mr. GREENE said the expenditure was, according to their own balance-sheet, £3835 for preliminary expenses, which ought to be borne by the contractors.

Mr. DICKINSON remarked that in their affidavit it was stated to have been a proper expenditure.

Mr. GREENE did not complain about that.

Mr. LINDLEY said there were some pending contracts which the shareholders knew nothing about, and they ought to know what the contracts were. It was said there would be contracts but for these petitions.

Mr. KARSLAKE had said there were offers which would mature into contracts afterwards.

The VICE-CHANCELLOR supposed Mr. Karslake could file an affidavit, and let them know what they were.

Mr. DICKINSON assented, and supposed communication would be made to the shareholders.

The VICE-CHANCELLOR said Mr. Lindley's client could attend the meeting and ask the questions about the contracts.

Mr. GREENE said his friend represented 20 shares for one petition and 23 for the other. They had a majority at the meeting of 689.

Mr. G. HASTINGS appeared for shareholders holding 689 shares.

Mr. LINDLEY said they wanted information. In January his honour had suggested that accounts should be produced and information given as to any contracts, and full information as to all other matters.

The VICE-CHANCELLOR said Mr. Karslake would hear that and would take care of it.

Mr. KARSLAKE said his friend knew that a balance-sheet was presented to the meeting on the 28th of January, and upon that balance-sheet they came to the resolution.

The VICE-CHANCELLOR said yes, the balance-sheet did not include what Mr. Lindley's client wanted, which was to know what contracts had been entered into, and what money paid, and in their own interest his honour should think they would explain what they had been explaining here about the Metropolitan District Railway Company, and so on.

Mr. KARSLAKE said his friend's client held his tongue on the 2nd of June and 12th of May, at those meetings, and if he was so curious, why did he not ask them?

Mr. GREENE said more information would be got from the new directors than was got from the old.

The VICE-CHANCELLOR said it would be in the paper on Thursday, July 2, after the motions.

COURT OF EXCHEQUER.—THURSDAY, JUNE 25.

(Sittings in Banco before Barons BRAMWELL *and* POLLOCK.)

ANDREWS *v.* THE MAYOR, ALDERMEN, AND BURGESSES OF THE BOROUGH OF RYDE.

Mr. H. T. COLE, Q.C., and Mr. MICHAEL appeared for the plaintiff; and Mr. MANISTY, Q.C., Mr. LOPES, Q.C., and Mr. BULLEN appeared for the defendants.

This case came before the Court of Exchequer in May last, in the form of a special case, and as, at the conclusion of the arguments of the learned counsel, the court took time to consider its judgment, we reserved our report. On Thursday last judgment was given.

The action was brought by Mr. Thornton Andrews, C.E., to recover a sum of £194 5s. from the Corporation of Ryde, for services rendered as a witness in an arbitration which took place between the Ryde Gas Company and the corporation, the object of the arbitration being, as our readers will remember, to settle the amount which the corporation were to pay to the gas company for the purchase of their works, pipes, and land. The leading facts of the case will be found in the judgment, which we give verbatim.

Baron POLLOCK: The plaintiff in this action sued the Corporation of Ryde for work and labour as a professional witness. Several objections were raised by the defendants to the maintenance of the action. The most substantial of these was that the defendants had never contracted with the plaintiff, and that his remedy, if any, was against the Local Board of Health. The reasons for, and the manner of the plaintiff's employment were as follows:—The defendants

are a municipal corporation, by virtue of a charter of incorporation, dated the 23rd of July, 1868, and the 15th of December, 1868, acquired all the rights of the "Ryde Commissioners," who acted under the Ryde Improvement Act, 1854, and who, in October, 1859, had adopted the Local Government Act, 1858, the effect of which was that the powers and duties of carrying the Ryde Improvement Act and the Local Government Act into execution were vested in the mayor, aldermen, and burgesses of the borough of Ryde. One of the powers given to the Ryde Improvement Commissioners by the Act of 1854 was the right to purchase the property of a gas company which supplied the town of Ryde with gas, and which was registered under the 7th and 8th Vict., c. 110. By the Ryde Gas Act, 1866, further powers were given to the gas company, and the right of the Improvement Commissioners was preserved, provided it was exercised within five years. In February, 1871, the Town Council of the borough of Ryde, being desirous of purchasing the property of the gas company, gave notice to the company, calling on them to give particulars of their estate, and the amount they claimed. The gas company sent in their claim, and the corporation proceeded, under the Lands Clauses Act, to appoint an arbitrator. The gas company appointed their arbitrator, and these two appointed an umpire. In all these proceedings, however, the corporation appear to have misapprehended their true position, and to have acted not in the name of the Corporation of Ryde, but in that of the Corporation of Ryde acting as the local board, and hence all the steps leading to the arbitration. All the notices to the company and the appointment of arbitrator were described on the minutes of the corporation as being done by the corporation "acting as the local board," and "by order of the said board." Arbitrators and umpire having been appointed, the next step taken was at a special meeting of the council of the borough, which was held on the 24th of April, 1871. At this meeting, what was called the local seal of the board was affixed to the appointment of a Mr. Stevenson, "as valuer on behalf of the corporation." It is not stated in the case that this seal was any other than the corporate seal of the borough, and for the reasons presently given we assume that it was the corporate seal. Mr. Stevenson, from this time, acted as valuer in the arbitration, but further witnesses being required to support his valuation, at a meeting of the sub-committee of the local board, held on the 16th of June, 1871, when Mr. Stevenson attended, the clerk was directed to retain counsel, and it was resolved that the plaintiff and four other professional gentlemen should be selected as witnesses to support Mr. Stevenson's valuation. In accordance with this resolution, the plaintiff was instructed by Mr. Stevenson, but no appointment was ever made under seal. During the arbitration the plaintiff attended and gave evidence, and the amount of his charges is admitted. Under these circumstances, it seems clear that the employment of the plaintiff was *de facto* by the corporation, acting as the local board, and the only question is whether the corporation and the local board can, for this purpose, be treated as independent bodies, so as to enable the corporation successfully to contend that the plaintiff having been retained and rendered services to the corporation acting as the local board, his remedy must be against the local board, or specifically against the corporation acting as the local board. There would be great force in this contention if it could be shown that the effect of the statute, by which alone the local board is created, was to establish a separate body. This, however, does not seem to be the case. The provision of the Local Government Act, 1858 (21 & 22 Vict., c. 98, s. 24), is as follows:—"The duty of carrying into execution this Act shall be vested in a local board; and such local board shall be, in corporate boroughs, the mayor, aldermen, and burgesses acting by the council." This does not create a new and separate body, or provide for an independent seal or independent power of contracting, but in substance enacts that in corporate boroughs the corporation shall be the local board; and, if so, then whether, in contracting, the name and style of the corporation is used, or that of the corporation acting as the local board, the essential body and contracting party is the corporation; or, to put the proposition in another form, the local board has no existence, and there could be no contract with these unless by the local board is intended the corporation, who, according to the Act, are the local board. Under these circumstances, we think that, though the local board was erroneously mentioned, the contract in substance was with the corporation, and therefore that they are properly made defendants in this action. The case of *Nowell v. The Mayor of Worcester*, 9th Exchequer, 457, to which we were referred by the plaintiff's counsel, is not a direct authority in support of this view, because there the corporation had contracted with the plaintiff under the corporate seal; but the judgment of the court, and especially that of the Lord Chief Baron, when he says, "The statute, in forming this body into a Local Board of Health, intended that they should contract as a municipal corporation," accords in principle with the view we now take. The conclusion at which we have arrived renders it unnecessary to consider the objections which were raised against the plaintiff upon the hypothesis that the cause of action and judgment ought to be looked upon as arising against and binding upon the local board, treating it as a body having an existence other than that of the corporation, and therefore we do not further refer to them. For the reasons given, our judgment is for the plaintiff.

Parliamentary Intelligence.

HOUSE OF LORDS.

Monday, June 22, 1874.

Report from the Select Committee on the Horbury Local Board Bill read, "That the committee had not proceeded with the consideration of the Bill, no parties having appeared in opposition thereto." The orders made on the 9th and 19th inst. discharged, and the Bill committed.

The Fylde Water Bill was read the third time, and passed.

The Fairfield Local Board Bill was returned from the Commons agreed to, with amendments, which were considered and agreed to.

Tuesday, June 23.

The Horbury Local Board Bill was reported, with amendments.

The Middlesborough Extension and Improvement Bill was returned from the Commons agreed to, with amendments.

The Wrexham Water Bill was returned from the Commons agreed to, with amendments, which were considered and agreed to.

The Llanelly Gas Bill was returned from the Commons agreed to.

Thursday, June 25.

The Ulverston Local Board Bill was read a second time.

The Aberdare and Aberaman Gas, Chester Water, and Hythe Improvement and Water Bills were returned from the Commons with the amendments agreed to.

Friday, June 26.

The Ulverston Local Board Bill was committed.

The Padiham Water Bill was reported without amendment.

The Horbury Local Board Bill was read the third time, with the amendments, passed, and sent to the Commons.

The Westleigh, Pennington, and Bedford Local Boards Bill was returned from the Commons agreed to, with amendments, which were considered and agreed to.

A petition against the Cupar Water Bill was presented from inhabitants of Cupar.

HOUSE OF COMMONS.

Monday, June 22, 1874.

SANITARY CONDITION OF EPPING DISTRICT.

Dr. Lush asked the President of the Local Government Board if he was prepared to state what steps he proposes to take to remedy the bad sanitary condition of the Epping Local Board district.

Mr. Sclater-Booth said: Epping is not a local board district. The guardians have become the sanitary authority under the Act of 1872. Since this question was last addressed to me I have received a report from the guardians, showing that the rate of mortality in the district had been exaggerated, and that, if the workhouse be excluded from consideration, it was only 19·13 per 1000 during the six months ending December, 1873, and is still lower in the present year. Great and unforeseen difficulties have arisen in the execution of the works of drainage and water supply undertaken by order of the Secretary of State some years ago, and these have been increased by the transfer of jurisdiction which has since been made. The Local Government Board have been urging upon the guardians to take over the existing works, and render them available, as far as possible, for the purposes for which they were designed.

The Llanelly Gas Bill (Lords) was read the third time, and passed.

The Middlesborough Extension and Improvement, and Wrexham Water Bills (Lords) were read the third time, and passed, with amendments.

The Nottingham Corporation Gas Bill (Lords) was read a second time, and committed.

A petition against alteration of the Municipal Corporations (Borough Funds) Act, 1872, was presented from Liverpool Licensed Victuallers.

The committee on the Sanitary Laws Amendment Bill was deferred till Thursday, June 25.

The Gas and Water Orders Confirmation Bill (Lords) was read a second time, and committed for Wednesday, July 1.

Tuesday, June 23.

The Lords amendments to the Aberdare and Aberaman Gas, Chester Water, and Hythe Improvement and Water Bills, were agreed to.

The Westleigh, Pennington, and Bedford Local Boards Bill, as amended, was considered; to be read the third time.

Thursday, June 26.

LIGHTING OF THE CLOCK TOWER.

Mr. M'Cullagh Torrens asked the First Commissioner of Works whether the Government intended to act on the report of the engineer of the Trinity House as to competition by trial of the electric and gas lights on the clock tower, in which report the superior advantages of the former, as regarded intensity and cost of illuminating power, were fully stated.

Lord H. Lennox said that some months since the question as to the permanence of the light referred to was discussed in that House, and he then stated that it was eminently a question for honourable members to decide for themselves. Since that time many honourable members had spoken to him on the subject, and they had all requested that the light should be made permanent, while he had heard no opinion expressed on the other side. He took it for granted, therefore, that such was the wish of the House. It was too late in the session now to make the necessary alteration, but he would give his attention to the matter during the recess.

METROPOLITAN WATER SUPPLY AND FIRE PREVENTION.

On the motion of Colonel Beresford, copies were ordered of a letter, dated the 14th day of May last, from the secretary of the Society of Arts to the president of the Local Government Board, together with a report from a special committee of that society, on the best means of preventing fires, and of obtaining a constant supply of water in the metropolis, and the evidence thereon. Of a letter from the secretary of the Society of Arts, dated the 23rd day of May last, setting forth the economies derivable from the administration of a constant supply of water under unity of management, and on a public footing. And of a letter from the secretary of the Society of Arts, dated the 3rd inst., and a communication enclosed therein, on the best means of protecting public as well as private edifices from fire.

The committee on the Sanitary Laws Amendment Bill was deferred till Monday, June 29.

The Neath Corporation, and Shipley Local Board of Health Bills (Lords) were reported, with amendments.

Friday, June 26.

The Westleigh, Pennington, and Bedford Local Boards Bill (Lords) was read the third time, and passed, with amendments.

A petition in favour of the Sanitary Laws Amendment Bill was presented from Sunderland.

Convictions for Wasting Water.—At the Wrexham Borough Magistrate's Court, on the 22nd inst., Mr. D. M'Cormick, of Chester Street, was summoned for allowing water to escape from the company's mains through his carelessness. Mr. Storr, secretary of the water company, said that on the previous Monday evening he was passing down Chester Street a little before twelve, when he heard a sound of rushing water. He tried to arouse the occupant of the house on ascertaining from whence the sound proceeded, but, failing, he got the assistance of police-constable Eady, and they went into the yard, and found the tap opened to the full, and the water wasting at the rate of 300 gallons an hour. He put in the Act under which the information was laid, and the notice issued by the company. He also said that while the company did not wish to be vindictive, they asked the bench for a substantial penalty, which would make others more careful. At the present time it was found that waste was going on at the rate of 60,000 gallons per night, and that, in the face of the present drought, was a very serious matter. Mr. M'Cormick said he was from home at the time, and he understood that his little girl had gone out for a little water after her mother had gone to bed, and something had frightened her, causing her to run in and forget to turn the water off. The bench inflicted the penalty of 1s. and costs. Mr. Storr hoped that in any future case the bench would consider the matter as a little more important, and inflict something like the full penalty, as the public would only laugh at such decisions as this. The mayor advised that the company should check waste by sending their man out at night to ascertain where it took place.—At Pontypool, on the 20th inst., Mr. Wm. Potter, a draper, was charged with illegally taking water belonging to the gas and water company, by connecting a gutta-percha tube to the company's pipe, and conducting that tube into a closet, and it was of the water being allowed to run to waste through the tube that complaint was made. Mr. Greenway, who appeared for the company, said they could have summoned the defendant under several clauses of the Act. They could have charged him with wasting water, the penalty for which was £5; but they only thought fit to proceed under one clause, in the 19th of 26 & 27 Vict., for connecting his tube to one of the company's pipes, the penalty for which was not to exceed £5. If defendant would say he was sorry for what he had done, and would take care that it was not wasted in future, and that there should be no connexion again, they did not wish to go further with the case. For the defence it was contended that there was no waste of water in flushing a closet. The magistrate said that as the company did not wish to press the case, and as their only object was to prevent waste of water, defendant must pay 15s., including expenses.

BOYD'S IMPROVED DIP-PIPE FOR THE HYDRAULIC MAIN.

FIG. 1

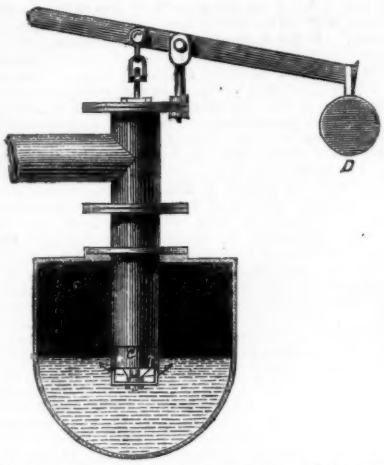


FIG. 2

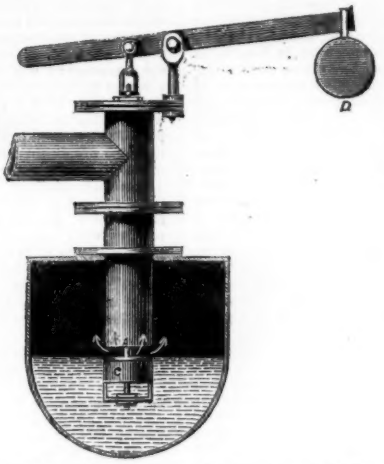
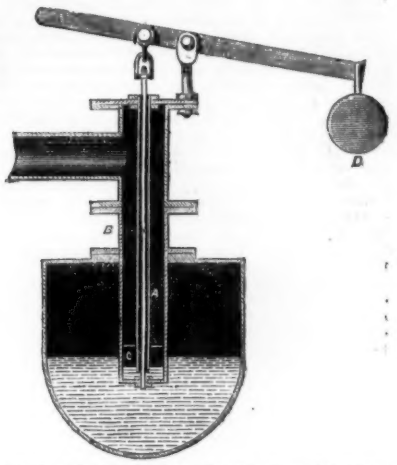


FIG. 3



The inventor of the above arrangement is Mr. George P. Boyd, manager of the gas-works, Alloa, N.B. Having for a considerable time past given much attention to this question, the inventor states that, being convinced of the bad effects of having a deep seal, which throws extra pressure on the retort, prevents the free generation of gas and favours the deposit of carbon, he was led to adopt a method which to some extent has been brought forward by others, but which possesses advantages, in his opinion, offered by no previously published systems. The improvements lately brought under the attention of gas engineers are worked by means of a stuffing-box, which he holds to be objectionable in any apparatus exposed to a very high temperature. The nature of the invention is clearly shown by the drawings. A is the seal-tube (1 inch malleable tube, fixed by two iron nuts), in which the ½-inch rod, B, works (free from friction), for raising and lowering the hollow plug, C. When charging the retort the lever is unhooked, and the hollow plug, C, is raised into its seat by the weight, D, thus sealing the dip-pipe. When the retort is charged, all that is necessary is to pull down the lever, which thus lowers the hollow plug, C, and removes the seal, thereby giving the gas free passage to the main. There is perfect security by the dip given to the seal-tube, A, and as no stuffing-box is required, there is neither danger nor trouble in working the apparatus. The above arrangement has been in satisfactory operation at the works of which Mr. Boyd is the manager, for a considerable time, and is open to the inspection of any gas engineer.

METROPOLIS GAS SUPPLY.

Metropolitan Board of Works.

At the Weekly Meeting of the Board, on Friday last—Mr. H. L. Taylor in the chair,

Mr. Fowler (Lambeth), in accordance with notice, moved the following resolution:—

That, in the face of the increasing price of gas in the metropolis, and of the fact brought to light by the recent inquiries before the Board of Trade, that the main inducements to economy and good management on the part of the gas companies have been taken away by existing enactments, and that, practically, to obtain a fixed rate of income, the companies are permitted to tax the consumers to an unlimited extent, it be referred to the Works and General Purposes Committee, to consider and report what steps should be taken either to afford an independent supply of gas in the metropolis, or to initiate some legislative measures to protect the interests of the consumers.

He said the question of the gas supply of the metropolis was one which had attracted, as the members of the board were aware, a very large share of public attention, as it had also the attention of the board and of Parliament, for a number of years. The great increase which had latterly taken place in the price of gas had brought this question again to the front. In fact, so dissatisfied had the ratepayers and consumers been for some years past, that one might almost say there had been a chronic agitation going on respecting this matter; and, although the board had from time to time taken great interest in the question, and, to some extent, initiated legislation, the fact was that, instead of prices being reduced, the effect of the most recent legislation—viz., the Chartered Gas Act of 1868, and the Imperial Gas Act of 1869—had been in the contrary direction. Those Acts of Parliament, when they were brought before the board, were accepted in the hope that great economy would ensue in the management of the companies, as they mainly went to promote amalgamation, whereby it was alleged the cost of carrying on separate undertakings would be diminished. This, however, had not been the case. In the year 1872 the Chartered Gas Company went to the Board of Trade, under the provisions of the Act of 1868, and obtained power to increase the price of gas. This year the company had applied again for a revision, and had been successful. The Imperial Company also, under the Act of 1869, had obtained this year a considerable advance of price. The result of that revision had been reported upon by the solicitor of the board, who, speaking of the inquiry which took place in reference to the Chartered Company, said: "I had obtained evidence to prove want of due care and management by the company as to the expenditure upon their works at Beckton, but the opinion of the law officers practically precluded the board from inquiring into any such topics before the commissioners, and it would seem that, however wasteful or improvident the expenditure of the company may be, or however injudicious the way in which they raise their capital, it is not competent for the board to allege before the commissioners that for those reasons want of due care and management has been exhibited, or that a deduction should be made from the prescribed dividend on that account." Speaking of the Imperial Gas Company, he said: "That Parliament has authorized gas companies to obtain from their customers a fixed rate of income quite irrespective of the commercial success of the enterprize, and one of the main inducements to economy and good management has by legislation been taken away." He (Mr. Fowler) thought from this it was perfectly clear that the result of recent legislation, which the board had accepted, in the hope that it would prove favourable to the consumers, had, on the contrary, produced considerable evils. In the course of the Board of Trade inquiry in the case of the Chartered Company, it came out that they had been paying out of profits the sums of money lost by the Great Central Company (which they had amalgamated) through the defalcations of Mr. Higgs. Those defalcations amounted to a very large sum. The company paid on the amalgamation as much as £15,000 on this account, and they were taking out of their profits £2500 every half year to make up the total sum of £70,000, so as to discharge themselves from this loss—the whole of which amount came out of the pockets of the consumers. The company also, in consequence of their new works at Beckton, and the discontinuance of some of their old stations, had been pensioning off engineers and others formerly in their employ. The sums paid on this account had been increasing ever since 1868, when their Act was passed. In 1869 the amount paid in the way of permanent pensions was £1217; in 1870, it was £1786; in 1871, £7081; in 1872, £9550; in 1873, £13,488; and the estimate for 1874 was £13,750; so that during these six years the enormous sum of £46,872 would have been paid in pensions, the whole of which came out of profits, and was therefore a charge upon the consumers. It also appeared in evidence that the large sum of £157,000 of the capital of the company was dead capital lying in the hands of the bankers, unproductive, as far as the consumers were concerned, and for which they had to pay 7 per cent.—it was so stated—and this interest had to be paid by the consumers. Probably there was some little rebate on the part of the bankers, but on the face of the accounts that money was lying dead, and the consumers were paying 7 per cent. for it. Under these circumstances, he thought it was really incumbent upon the board to look into the matter. First of all he found, on examining the evidence very carefully, this fact, that the two largest companies—those whose Acts were the last obtained—were the companies charging the highest price for gas—a price which could not but be regarded as excessive. He found also, on looking at the evidence, that the increased price which they asked the Revision Commissioners to grant them, did not depend at all upon the disturbance in the coal market, but really arose out of the Act of Parliament itself, so that if there had been no disturbance in the coal market, and they had gone before the commissioners, they would still have had an increase of price, though perhaps not quite so much. This was a very striking fact, and showed the necessity for the board to take up the matter, and endeavour to mitigate some of the evils of existing legislation. But it was a difficult thing to say what course the board ought to take. The board in 1867 did attempt to deal with the matter, but the bill fell through, owing to the great power and influence brought to bear against it by the companies. If that bill had been successful, the consumers would not now be in the state they found themselves. But the board of that day were obliged to give way, the power brought to bear on the other side being so strong there was no standing against it. On Nov. 8th, 1867, the special Gas Committee of the board made a report on the subject, in which they said: "They consider the main cause of the failure of legislation during the present year to have been the absence of any bills authorizing the establishment of an independent supply of gas by the local authorities, and they recommend that unless the companies are prepared during the recess to consent to an arrangement on terms satisfactory to the consumers, no measure such as that of the present year should be again introduced, but that every facility should be afforded to the local authorities of the metropolis, in the session of 1868, for the introduction of an independent supply." So that there was from the board itself a clear indication of the direction in which legislation should proceed, in order to emancipate the consumers from the thraldom of the gas companies. The fact was that it would be perfectly impossible to legislate at all—Parliament would not give them any power of the kind desired, unless they showed that they were prepared in some way or other, by an independent supply or otherwise, to afford to the public that amount of relief which the gas companies at the present time were unable—or not inclined—to give. Now, this was a very large question, and the board were in possession of Sir John Thwaites's proposition on the subject. The basis upon which their late chairman went was that of giving the companies 6 per cent. annuities on their capital; and it certainly appeared a very fair and equitable arrangement. But he (Mr. Fowler) believed the time had now gone by for entertaining any such proposal, and he was quite sure the general body of consumers would feel that it would not be a satisfactory arrangement. He could not help thinking himself that the board should have the power, in some way or other, to contract with parties for a supply of gas, or to subsidize parties, or to give to the vestries and local boards the opportunity of supplying their own parishes and districts, or that legislation should be initiated, under which the maximum price of gas should be settled, and the dividends of the companies be made dependent upon the price charged, so that, as the latter decreased, the rate of the former should increase. This would give the companies some inducement to exercise "due care and management" with the view of keeping down their charge to the public to the minimum. All these considerations the board were now bound to take up. There was hardly a vestry or district board in the metropolis which had not passed resolutions from time to time on the question of the unsatisfactory condition of the gas supply. These resolutions had been sent to the board, and they were bound at this early stage to begin to consider what they could do in the next session of Parliament. He feared that at this time of year they could take no steps to obtain legislation during the present session, but they ought at once to take up the matter, and carefully consider it in all its aspects, and ascertain the opinions of the vestries and district boards, so that during next session some legislation might be initiated, which would result in the consumers of the metropolis being supplied with gas on terms somewhat similar to those on which Manchester, Liverpool, and other large corporate towns were supplied. The two companies to which he had referred were not the only companies which had raised the price of gas. The Phœnix Company, on the south side of the river, had increased their price, and in that quarter of London the anomaly existed of two prices of gas being

charged in the same street. On one side of the Brixton Road the Phœnix Company charged 4s. 6d. per 1000 cubic feet, and a meter-rent in addition; on the other side, the South Metropolitan Company charged only 3s., and supplied the consumers with meters gratuitously—the gas on one side of the road being no better than it was on the other. And yet the consumers who were charged the high price were unable to take gas from the company which charged the low price, because the Legislature had prohibited it. This seemed to him to be quite contrary to every principle upon which all other businesses were regulated. Another question to which the attention of the board should be directed was that of the 10 per cent. dividends to which the companies claimed to be entitled. This appeared to him to be the real difficulty in the way of obtaining redress, and unless the law sanctioning this rate of dividend was abrogated and some new principle laid down, he thought it was perfectly impossible to give relief to the consumers. At the same time he felt sure that if these questions were only thoroughly ventilated, notwithstanding the large amount of influence the companies could bring to bear against a reform, the present state of things was so anomalous that Parliament would grant some measure of relief to the public, and the board were the proper body to initiate legislation in this direction. They were the only body which represented the metropolis; they were mainly interested in the question. The improvement of the metropolis was in their hands, and he felt convinced that it was their duty to take some steps to get the law altered, so that the supply of gas in London might be placed on as satisfactory a footing as it was in the large provincial cities and towns of the kingdom. With these convictions pressing upon him, he begged to move the resolution of which he had given notice.

Mr. E. D. Rogers (Camberwell) seconded the motion.

Mr. Newton (Mile End) thought there was great difficulty in dealing with this question, and the difficulty had been increased by the proceedings before the late Revision Commission. But the time had now come when it was clearly the duty of the board, in the interest of the consumers of the metropolis, to take some steps in the matter. He feared, however, they were now in a very much worse position to deal with the question than they were at the time to which Mr. Fowler referred, when it was contemplated to purchase the undertakings of the companies. It was then believed that they could be bought by giving the companies a guaranteed 6 per cent. in the stock of the board or some other stock. But after the late revision, at which it appeared that the companies are guaranteed the payment of 10 per cent., he should fear very much that if they went to purchase under the Lands Clauses or any other Act of Parliament, whoever had the valuation of this property would look upon it as equal to Consols, for that was really what it was at the present time, and the board would be charged an enormous sum as purchase-money. He therefore did not see his way, in the present state of the law, to propose any such thing as the purchase of the companies. But he thought it was clearly the duty of the board to say that the legislation of the last few years had been entirely wrong; that the only effect had been to increase the value of gas property to the proprietors, and to take from the consumers the advantages they previously enjoyed. It was their duty also to say that something ought to be done by the Legislature to put an end to the complaints all over the metropolis, and he had come to the conclusion that the only thing to do was to throw the whole thing open. They had found that the present monopoly—restricted monopoly, as it was said to be—was not restricted, but that it was of the most unlimited character. It was well enough to say it was restricted as far as the 10 per cent. dividends were concerned, but it was not even so, because the shareholders of some of the companies had been receiving more than 10—more than 20—per cent. on the capital invested, and that under the sanction of the existing law. It would be remembered that, in the late revision, the board strove hard to obtain an investigation into the mode in which the Chartered Company had expended their capital. That company went to Parliament for an Act to raise £1,000,000; and, when a company asked for a large sum to carry out large works, all that the committee of the House of Commons did was to see that the estimates were ample. They did not attempt to restrict the company, and say, "You ought to do this work for £600,000 or £700,000;" but they said, "We give you power to raise sufficient according to your estimate," and in this way the Chartered Company obtained power to raise £1,000,000. Now, that company having power to pay 10 per cent. on that sum, and being enabled to charge such a price for gas as would enable them to divide at that rate, it was a great source of profit to them to distribute this capital among their shareholders—for this reason, that the moment they gave their shareholders £100 stock, those shareholders could go into the market and get £160 for it. The company, therefore, were interested in a lavish and extravagant waste of capital, because the more capital they could expend, the more costly they could make their works, the more reckless they were in throwing away their money, the greater would be the interest of their proprietors. And when, as at the late revision, the board sought to inquire into whether the money raised had been properly expended, and whether good management and skill had been exercised in carrying on the expenditure, the commissioners took the opinion of the Law Officers of the Crown, who said that Parliament having given the company power to raise £1,000,000, they had no power to inquire into its expenditure. Now, it was clear that if, instead of creating shares at 10 per cent., the company had gone into the market and borrowed, on debentures or otherwise, on the security of their rental, they might have got what they wanted for £60,000 instead of £100,000, and thus have saved £40,000 a year in interest. But then they were not interested in doing such a thing: the directors were interested in having a large portion of the new capital for themselves, and the shareholders in the same way. It was a perfectly "happy family" as between shareholders and directors, for they were all interested in a wasteful expenditure. Now, he did not make a charge against them of wasteful expenditure, but what he did say was, that they could have raised the money on better terms, and that that did not suit the company. Under these circumstances, he thought he was justified in asserting that 10 per cent. had not been the measure of the interest which these people had taken but that in addition they had had large bonuses in the way he had described.' And then the commissioners, when they met, considered themselves bound to award such a price for gas as would enable the companies to pay 10 per cent. —their "statutable dividend," for those were the terms they now used. They did not ask for 10 per cent. if they could earn it, but they said: "You are bound to impose on the consumers, who are compelled to take our gas, such a price as will enable us to pay 10 per cent.; and if you do not give us such a price as will yield us 10 per cent. this year, we have a large fund—the insurance-fund —which we will use to make up that amount, and next year we will come to you to replace the money." And the commissioners said that they had no choice in the matter, and they did it accordingly. He (Mr. Newton) therefore considered that gas property as it now stood was as safe as Consols, and he had no doubt that surveyors under the Lands Clauses Act would so value it. Since the last revision there had been a considerable advance in the market price of gas shares. Some time ago £100 worth of stock could be bought for £140; now it could not be bought for £160, and it was gradually going up. The dividend was regarded as secure and safe; there was the whole gas consumption of the metropolis at its back, and he did not know why people should not buy gas property to pay 4 per cent. as readily as they now bought it to pay 6 per cent. With reference to the policy of the board, in the interests of the public, he thought they should not go in for purchasing the undertakings. He once thought they should do so, and he should say so now, at the price than contemplated; but before they went into a purchase, they must make an attempt to set legislation right. They must go before Parliament, and say: "See what you have done; you have enabled these people to invest large sums of money in any way they like, to distribute it among their shareholders, to expend it in whatever extravagant way they choose, and the commissioners, whom you have appointed to revise the price of gas, are stopped by you at the threshold when they proceed to inquire whether the money invested in the works and plant has been properly expended." It was a farce to say the companies could only pay 10 per cent. so long as they were enabled to raise and expend capital in the extravagant way they had done. And he could not but feel that, considering the amount of money this board had spent in endeavouring to protect the interests of the consumers, it was almost heartrending to find that they were unable to do anything in the present state of the law. He therefore supported the motion in the hope that the committee would be prepared to bring up some proposal that the board should have an interview with the Government on the question. For he was bound to say he thought the Board of Trade had not done their duty in respect of this question. From time to time they had been consulted; they had had representations made to them from the House of Commons, and yet they had not taken proper care to see that legislation in reference to the gas supply was consistent with itself. The Acts of Parliament which had been passed in the last few years, giving one standard of price and quality for gas in one district, and another in another—enabling one company to raise capital on one set of conditions, and another on another—was disgraceful to the Legislature. Of course, the Metropolitan Board had no power; they were uninfluential, except so far as their counsel could represent their opinions; but one would think that a department like the Board of Trade would endeavour to obtain from Parliament some consistent code of legislation, so that all the companies might be dealt with in the same equitable manner, and the consumers in one district protected equally with those in another. He hoped the committee would be able to prepare some comprehensive scheme which would recommend itself to the Government in the first instance, and that would lead to the introduction of a bill to place this question on its proper basis. At the present moment he knew of no question in the metropolis in a more unsatisfactory condition than the legislation respecting the supply of gas.

Mr. Brushfield (Whitechapel) said he should not object to the question being sent to the committee. He could not say one word in approval of the present state of things with respect to the metropolitan gas supply, for he considered it was most unsatisfactory. That it was so was due to the passing of that ridiculous Act—the City of London Gas Act, 1868—for which the clients of his friend, Mr. Dresser Rogers, were responsible—an Act that created one of the greatest evils connected with gas supply. He was very glad to hear Mr. Newton speak of gas property as being "as good as Consols," as he was himself a large proprietor, and it was satisfactory to find that what he had regarded as somewhat doubtful had been settled by Act of Parliament upon such sure principles as the Three per Cents. The City of London Gas Act, 1868, introduced changes from the principles laid down in the Metropolis Gas Act, 1860, which were most mischievous. The Act of 1860 said the companies should not advance the price of gas beyond 4s. 6d., and should not pay more than 10 per cent. dividends. But the Act of 1868 unsettled this state of things, and told the companies subject to it that if, at their maximum price, they could not pay the shareholders 10 per cent., they might go before Revision Commissioners and obtain an increase—providing they had exercised "due economy." Due economy! What an expression. It was like a Dutchman's breeches. But the commissioners had no power to go into the question whether the companies had raised and expended capital with "due economy;" they could only see that that principle was carried out in the purchase of coals, &c., and the management of their manufactory. He maintained that this was a perfect farce—it was at the root of all the present complaints by consumers, and it was an evil that required rectification. Mr. Fowler complained that a consumer on one side of a street could get gas at a certain price which his neighbour on the other side could not obtain, because he was in another company's district. But this was not an unmitigated evil; in fact, it arose out of the wise provisions of the Act of 1860, which sanctioned the districting arrangements made by the companies, and put an end to the confusion and costly mode of carrying on business previously, when the companies were in competition with each other. Notwithstanding the remark made by Mr. Fowler at the commencement of his speech, that, if coals had not been dearer, the companies under the Act of 1868 could have obtained a revision of price, he (Mr. Brushfield) maintained that the price of coal was a material element in the cost of gas. In the Commercial Company, with which he was connected, they found that with the increased price of coal they could not pay their shareholders 10 per cent. But they did not raise the price of gas; they took from the reserve-fund a sufficient amount to supplement their profits, in order to give the shareholders the dividend to which they were entitled. He regretted that the great companies (the great amalgamations, which he regarded as great evils) did not feel justified in doing the same thing, and thus help to tide over their difficulties until the price of coal was reduced.

Mr. E. D. Rogers (Camberwell) wished to correct an observation made by Mr. Brushfield, and to contradict him *in toto* with respect to one fact. The board knew very well that the Corporation of the City of London and this board in 1868 were not successful in carrying the measure they desired. The Act now called the "City of London Gas Act" was not the bill promoted by either body; it was a bill adopted by the House of Commons committee under the express assistance of Mr. Baxter. For himself, he had never said that that Act was good for the consumers, more than up to a certain point, and, therefore, he was surprised at the observations made by his friend, Mr. Brushfield. He knew the Commercial Company, of which Mr. Brushfield was the chairman, did their duty to the public, and he gave them credit for their management; but the other companies did not do so. The question of economy with them now meant the largest possible expenditure in salaries of officials, and outlays totally unremunerative to the consumers interests, to the extent of millions. He was surprised, therefore, that Mr. Brushfield should justify the companies. He was not certain that the question involved in the motion was quite ripe for discussion, but no harm could arise from a reference to the committee. It would show the consumers of the metropolis that the board were alive to their interests, and he believed that if the House of Commons were appealed to, there would be more consideration now manifested for the general body of consumers than had hitherto been the case.

Mr. Lloyd (Plumstead) was glad to find that his friend, Mr. Brushfield, while arguing on behalf of the companies, was prepared to vote for the motion. The present unsatisfactory state of the gas question in the metropolis was brought about by the withdrawal of every incentive to economy in the management of the companies by the guarantee to them of 10 per cent. dividends, and the facilities afforded them of raising money by the issue of new shares, instead of having to go into the market and raise it by debentures at 4 or 5 per cent. The only difficulty in the way of vestries and district boards supplying gas was the absence of power to open the streets to lay down mains. Probably Parliament might be induced to invest them with that power.

Mr. Freeman (Kensington) said the board was induced to accept the Act of 1868 upon the promise of the companies, that if reliance was placed upon them they would work honestly, and manufacture gas in the cheapest way possible for the public. But it had been demonstrated beyond doubt that they had been utterly faithless to their promise. They had acted in the most selfish manner, had accumulated capital for the mere benefit of their shareholders, and had been utterly regardless of the interests of the public. If, as the result of the

proposed inquiry, it should turn out that the board was not able to purchase the works of the companies at a fair price, in his opinion they ought to go in for competition. The punishment which would then fall upon the heads of the companies would be of their own seeking, and they would have no one to blame but themselves.

Mr. LESLIE (St. George, Hanover Square) said the whole question was in a very small compass. If the board would devote their energies to getting rid of the Act of 1868—the source of all the mischief—they would get rid of the chief cause of complaint among the consumers. As Mr. Rogers asserted that the City Corporation were not responsible for that Act, the board might look for the co-operation of that body in obtaining the repeal of so obnoxious a statute, and he believed the present Government would be found ready to assist them in their endeavours.

The motion was then put, and carried unanimously.

DELEGATE MEETING IN ST. PANCRAS.—On Tuesday last, the adjourned meeting of representatives of various vestries and district boards was held in the St. Pancras Vestry-Hall—Mr. Hoppey in the chair. The discussion was upon the motion and amendment submitted at the meeting on the 9th, the former being in these terms: "That in the opinion of this meeting it would not be wise to entertain the idea of purchasing the interests of the gas companies, but to petition Parliament to allow other companies that may be formed to compete in those districts which the present companies have so unjustly monopolized." The amendment, which was carried by a majority of four votes, was—"That, with a view to giving a practical effect to the foregoing resolution, this meeting, representing the united vestries of the metropolis, call upon the Metropolitan Board of Works, before whom the entire gas question has recently been brought, to consider the best means to be resorted to in order to combat the gas monopoly, and to communicate its determination to this board of delegates." A further motion was then made to the effect "That the Metropolitan Board of Works be requested to obtain from Government the power to examine and inquire into the mode in which the gas companies have raised and expended their capital," but the meeting adjourned without coming to any decision thereon.

ST. JAMES'S, WESTMINSTER.—At the vestry meeting of this parish on Thursday last, a special report was brought up from the Works and Improvement Committee on the subject of the late inquiry by the commissioners appointed by the Board of Trade to revise the scale of illuminating power and price of the gas supplied by The Gaslight and Coke Company. The report stated in effect that the committee are of opinion that the company does not realize sufficient from the sale of tar, ammonia, coke, &c.; also that it would not be wise to entertain the idea of purchasing the interest of the present gas companies—a course of proceeding to which the companies are looking forward—at a great expense to the ratepayers. The committee objected to the principle of a guaranteed dividend, as at variance with the principles of free trade. On the motion to adopt the report, an amendment was proposed—"That the vestry consider the recent rise in the price of gas unjust and impolitic, and are of opinion that a bill should be introduced into Parliament for purchasing these companies by the Metropolitan Board." The amendment was lost, and the original motion was adopted. It was resolved to send a copy of the report to the Metropolitan Board.

BRITISH ASSOCIATION OF GAS MANAGERS.

(*Continued from page* 839.)

Mr. C. WOODALL (London) read the following paper on

GASHOLDERS.

In 1868 an interesting and valuable paper, followed by an equally interesting discussion, was contributed to this association, on the subject of gasholders. When, at the request of our secretary, I undertook to furnish a paper on the same subject, it was with the feeling that the discussion to which I have referred stopped far short of exhausting the interest of the questions then raised, and that the continuance of that diversity of opinion and practice among engineers, to which Mr. Anderson then referred, made the matter one worthy of renewed consideration.

Looked at cursorily from the outside, it would almost appear as though gasholders were made to an accepted and approved pattern, and differ only in size, and that there can be little room for variety of practice in their construction. Nothing could more fully dissipate such an idea than a comparison of a few examples of the considerable number erected in London during the past few years.

I have no intention of attempting to criticize the details of difference between these examples, as for the purpose I have in view they resolve themselves into three separate and very different styles or systems—viz., the two to which attention was directed in 1868:

1. Gasholders with trussed roofs.
2. Gasholders without roof framing, and where, consequently, the top curb has to bear the strain upon it without help; to which must now be added
3. Gasholders with rigid frames springing from the side posts, as now built by the Chartered Gas Company.

To-day, as six years ago, the principal question to determine is whether the roof needs a framing at all; he form and character of that framing being only of interest to those who answer that question in the affirmative.

Let us state first what are the purposes the trussed framing serves; and then see whether the same results can be obtained without it; and, further, try to determine whether the saving in weight, cost, and complication, resulting from the omission of the trussing, is counterbalanced by any equally weighty objection.

I think it will be admitted that the trussing serves two purposes and two, only—viz., first, as a frame to support the sheets forming the roof when the holder is at rest, and, secondly, as a series of struts, to keep the top curb in position when the holder is in action.

I need hardly remind the members of this association that when calculating the strength of the parts of a trussed gasholder roof the weight considered is that of the roof sheets, and any possible or probable load which may be put upon them, and that the main anxiety of the designer is, so to make the whole framework that it may be carried up and down without injury to itself. That it is wanted by the roof sheets except when the holder is at rest, I presume no one will be disposed to assert; and therefore I say that the same purpose is better served by providing a much simpler fixed framing of timber within the tank at a small proportion of the cost of the moveable iron one.

We come then to the second item of service performed by the framing—viz., the strutting of the top curb. This service it certainly performs, but to what extent is it required? The tendency of the roof to rise involves necessarily a strain, tending to cause the sides to collapse, and although the presence of the gas is in favour of the sides, keeping them in their cylindrical form, and that form is the best that could be devised to resist such a strain, it is one for which efficient provision must be made in the strength of the curb. Again, the pressure of a gale of wind, blowing with a force of, say, 40 lbs., exerts a very strong power in the same direction, operating to crush in the curb in the inward side. With a holder of 140 feet diameter, and 70 feet of depth, the total amount of that force tending to blow the vessel before it would be about 90 tons. This force must be divided between the three ordinary points of contact, top curb, bottom curb, and cup, which gives for the top curb, say, 22 tons. But that must be again divided between at least a half of the total number of columns composing the framing, which, supposing that number to be 18 or 20, reduces the actual crushing strain resulting from a very heavy gale of wind to a very small matter indeed. I am decidedly of opinion that the considerable force of the wind, and the inclination of the roof to draw in the sides, together amount to a sum not more than is met by a fairly strong ring, such as is usually made by the outer row of roof sheets. I do not know whether it is the custom of any gentleman present to leave the sheets entirely free from the framing; the general custom certainly is to bolt the centre plate to the top of the king-post, or truss column, in which case in seems to me possible that the condition of the trussing may be reversed, and the tension-rod put under compression, and therefore rendered useless while the holder is at work.

Very great interest attaches to the novel system lately adopted by the Chartered Gas Company's engineers, and which is now being extensively applied by Mr. Wyatt on various stations of that company and elsewhere. Mr. Wyatt has furnished me with a set of drawings of a holder now in process of erection on this plan, and they are on the wall.*

Granting for a moment that there is a necessity for a framing, this appears to me a most excellent plan. The parts are few and simple. There is no necessity for a bolt in it, and, when riveted up, the whole is possessed of great strength. The ribs, assisted by the rings of purlins, are excellent struts, and Mr. Wyatt will, I think, find it easy to point out many particulars in which this plan is superior to that ordinarily in use.

I am most anxious in this matter to speak as one desiring to obtain the opinions of others, and not dogmatically to express my own. I am aware that the number of engineers who build holders without trussing is very small indeed as compared with the number of those who do introduce it, and for the experience and ability of many of the latter I have the highest possible respect.

And I know further that the manufacturers are almost all in favour of the older system.

About ten years ago I had to build a compartively small holder of 80 feet diameter. Upon asking tenders for it, one eminent firm of builders refused to offer, because there was no roof-framing, and I put in a trussed roof in deference to so strong an expression of opinion. The more I think of the matter, however, the stronger my opinion becomes that the framing is not only unnecessary, but that it is a source of weakness to that which it is designed to strengthen.

The untrussed holder, of which I have brought a few sketches, has recently been completed by Messrs. S. Cutler and Sons, for the Phœnix Gas Company, to my designs. It is altogether an exceptionally strong one, partly because it is erected in a position, close up to a street of houses, where any appearance of weakness would be specially objectionable.

The curb in this case is made of two rings of 6 inches by 6 inches by ¾-inch angle iron, with a double ring of ⅜-inch plates, 12 inches broad, riveted to the lower one. The top plate is ½-inch thick, and I need hardly say is the most important part of the curb. Originally it was intended to put a series of lattice bars in the position shown on sketch, my object being that as the thick top plate took its slight rise these bars would take hold of the double plate, and so it would be brought into use without altogether relieving the top angle iron. As, however, we felt it desirable to put gusset plates as struts under the top carriages, I left out the lattice work and put in gusset plates intermediately between the carriages, as well as under them. The holder has a working capacity of slightly over a million cubic feet, and its weight is 280 tons.

On the same station of the Phœnix Gas Company is a holder 160 feet diameters designed by the late Mr. Innes, with a working capacity of a million and a quarter, and weighing under 250 tons. The top in that case is formed by a ring of ⅜-inch plates 1 foot 9 inches wide, connected to the side sheets by an angle iron 6 inches by 3½ inches by ⅜-inch. The sides are suspended from this angle iron by a single row of ½-inch rivets. That holder has been in constant use for 20 years, and, so far as the roof is concerned, shows no sign of weakness. Mr. Innes being of opinion that too much weight was put into both holders and framing, had the courage of his opinion, and not only made a light holder, but gave it also a very light framing. The columns are made of wrought-iron plate, ¼-inch thick, except at the bottom, where they are ⅜-inch. There are no girders, the columns being simply tied together with two sets of tie-rods, one at top, one half way up. This framing sways before a strong wind to an extent that would in my opinion be dangerous if the holder had a heavy crown. As it is, we have thorough confidence in it. The absence of girders is, however, a decided error. The framing has proved itself quite strong enough for its purpose while the holder is in work, as the carriages strut the columns and keep them out against the tie-rods; but, before it can be allowed to empty for repairs, a ring of girders must be put round the top to prevent the columns falling in.

It is hardly possible yet to refer to guide-framing without thinking of the accident to the gasholder at Beckton. Having that in mind, and comparing the guide-framing, to which I have referred, with the one which was there overturned, the conclusion seems very obvious that it is impossible to make up by weight of metal for want of care.

It is very desirable that the depth of each lift should not be less than one-fifth of the diameter. I have known large holders so shallow in proportion to their diameter that a couple of men could push them out of level. Such must always be a source of annoyance and trouble to those having charge of them.

There is another point worthy of attention, and that is, the means of keeping in a vertical line the sheets of the outer lift of telescope holders. That lift is resting for a much longer proportion of its life than the inner one, and is usually less firmly supported. As it is impossible, because of the small width between the side sheets and the cup of the inner holder, to get efficient posts inside the plates, they ought to be fixed outside, even although appearance suffers somewhat thereby. In some cases a railway metal or other post is put inside the outer holder, and rubbing pieces are fixed against the cup of the inner one to slide against them. Trouble often results from this plan, as the inner holder is much disposed to stick and cant in falling. I have known cases where these rubbing pieces have been fixed on the top of the cup, which has become indented at the points where they have been, and swelled out intermediately. In one case the sheets of the outer lift of a holder were worn into innumerable holes at the centre, between each pair of rubbing pieces, in less than four years.

I make no apology for confining my remarks principally to the question of roof-framing; I regard it as one of great interest and importance, and I know that I am not alone in regretting the incompleteness of our previous discussion of it. I should not have ventured, however, to occupy your time, had it not been for my conviction that those who differ from me as to the desirability of omitting an inside framing altogether, would find subject matter for reflection and discussion in the new plan, of which I trust Mr. Wyatt will be the exponent.

Mr. G. ANDERSON (London) said he was very proud indeed to see a man of Mr. Woodall's intelligence come over to his side on this question. He himself, in 1868, read a paper before the association, on the construction of gasholders, and he then maintained his opinion that gasholders without trussing were better. Why? Because the centre of gravity of the whole mass was much lower without than with a top trussing, and was not likely to be displaced in a gale. A heavier guide-framing was also required with a trussed holder; and, therefore, while doing one evil, they had to create another; for he contended that a man did not know his business who should put in a heavy trussing. He considered it wrong, as a point of engineering, to put anything in a place where it was not wanted; and when a heavy trussing was put in the crown of a gasholder, it was not only that money was wasted, but a great evil was created. Very often in gasholders it would be found that there was no connexion between the top and bottom; but in the design exhibited by Mr. Woodall there was a

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* Mr. Wyatt has courteously furnished us with a set of these drawings, which we propose to engrave and present to our readers very shortly, with descriptive details.

connexion in the middle. Not only that, but there were also diagonal rods. Some people said that these things did not look well; but in his opinion a thing looked well when it was the best thing for the purpose; and nothing looked well when there were unnecessary extravagances about it. With reference to the cast-iron columns employed as guiding standards, he objected to them as an absurd attempt to imitate the architecture of the Greeks, as shown in the front of the temple of Theseus—absurd in their pretensions, because instead of the height being, as the ancients erected them, about ten times the diameter, the columns of a gasholder were nearly twenty times. It was no use trying to be architectural in such constructions, and, therefore, instead of employing cast-iron columns, he used simple cast-iron girders upon the edge, with a broad flange behind and a narrow flange in front. Against the latter the carriage wheels travelled as the holder rose and fell. Why did he prefer this plan? Because he knew that these girders were stronger than a circular column. There was nothing to be said in favour of the prevailing system but old custom. He believed that by his method, with one-fourth of the material, he obtained more strength, stability, and certainty, than by using round columns. His standards were tied together at the top, and there were diagonal stays in the middle, which made them four times as strong as they would otherwise be. At one of the metropolitan gas-works he had seen a holder 100 feet in diameter, the base-plates to the cast-iron columns of which weighed three tons. This was just the weight of each entire standard column of the holders at the Great Central works. With regard to trussing, he remarked that some years ago he was called upon to examine a large gasholder which had something wrong with it. It was a holder 160 feet in diameter. On examining it, he found that there was a heavy trussing in the roof, and the sheeting, although built upon it, was off the trussing. The gasholder was floating at the time, and the sheeting had risen about five or six inches in the centre, gradually tapering down to nothing at the curb. Seeing this, he began to question with himself whether the trussing was put in to support the sheeting, or the sheeting to support the trussing, and he was obliged to come to the latter conclusion.

Mr. HARTLEY (London) said the late Mr. A. Wright erected a gasholder of about 150 feet diameter, for the Western Company, without trussing, and he believed that Mr. Wright was the first to put up a holder with a hollow curb.

Mr. WYATT (London) said Mr. Anderson referred to the holders at Bow Common, and he had himself erected one close to them. He had often been surprised at their weakness; they were most fragile structures, and but that they were clustered together, and were after all comparatively small, he thought that the whole of them would have blown away. They were so flexible that almost any movement of the foot or body would distort them in shape. It was impossible to apply the principle upon which they were constructed to holders of a million feet capacity. Of late years a new principle had been adopted in erecting gasholders. It had been found that the great strain upon a holder was not when she was down and at rest, but when rising and floating. Supposing a holder to have 300 to 500 tons floating weight, the whole strain was on the top curb, which, let them do what they would, tended to distort the holder. Hence it was always found, when a holder began to rise, the guides and pulleys left the framing, and in consequence the whole of the rollers left the framing also. In order to obviate that, the system had been introduced of ribbing the holder. They did not put all the weight in the top, because the trussing occupied but a very small portion of the whole weight of the wrought iron. He had no hesitation in saying that by this system of framing there was a great saving in the curb, and they could send a gasholder of 200 feet diameter up with only four points of support. With a great weight of holder there was always a tremendous strain upon the curb, and nothing short of an enormous box girder would prevent distortion. There must, therefore, be something to carry it down to the bottom. Hence they dispensed to a great extent with the curb, and introduced large gusset pieces; the effect being, that they could carry a holder of 180 feet diameter from side to side without any support whatever. It perfectly carried itself. He had put in a central brick pier, but found it quite unnecessary. As to the amount of framing, it was entirely a matter of fancy. His own opinion was that very little was required, provided they had a good vessel. He should be content with eight points of support, with a holder of 200 feet diameter. It would be better to make 8 or 16 points of support, very bold, and singularly impressive from their magnitude, than to fritter away material in 28 points. As to the effect of wind upon holders, he believed it was very trivial. With 700 or 800 tons of metal, it would be found that the only effect upon the top frame was some 20 or 30 tons. Generally speaking, he was inclined to disregard it altogether. There had been a failure with a holder at Beckton, but that was due to bad construction. It was not finished, and some of the joints were imperfect. The thing opened, and down it came. The design on the wall showed the holder constructed for the Newcastle Company. That holder was the strongest and cheapest ever made. The holder and tank cost only £15 per 1000 feet of storeage; and, certainly, so far as strength and rigidity and unyielding qualities were concerned, it was as perfect as any one could wish. If he had to design it again, he should take off 25 per cent. of material, and it would then be quite strong enough. In fact, if he took off 75 per cent., he was sure it would then be stronger than the Bow Common holder.

Mr. DOUGLAS (Portsea) remarked that, with regard to the effect of wind upon a gasholder, neither Mr. Woodall nor Mr. Wyatt had referred to one important point. Assuming the greatest power of the wind in England to be about 20 lbs. per square foot, and he believed it had rarely exceeded that—ordinarily it was from 10 lbs. to 15 lbs.——

Mr. WYATT said when the gasholder fell at Beckton it was over 30 lbs.

Mr. DOUGLAS continued: The force represented by the wind was not all that a gasholder had to contend with. A gasholder could not be made so rigid but that there would be a certain amount of yielding, and this gave to it at times a swinging motion. He had seen this motion as much as 18 inches, and the momentum of a gasholder in this swinging condition was more than equal to the force of the wind upon it. The impact of a heavy body which has acquired such a momentum would be at least twice, perhaps three times, the amount of the wind. He had tried to find out some formula by which this might be calculated—some practical mode of ascertaining what is the amount of momentum a gasholder has in a certain position, and the amount of strain to which it was subjected. He had not been able to satisfy himself on the point, but he was sure that it would surprise many members to discover how much of the strain was due to the impact and momentum, and how little to the direct pressure of the wind itself. He quite agreed in the opinion expressed that, as at present constructed, too many columns were employed; but, until it could be satisfactorily determined what was the amount of strain the columns had to resist, it would be impossible to prevent those who had the construction of holders doing something of the kind to ensure safety. With regard to trussed and untrussed roofs, he would only remark that there was a great deal of conservatism about gas engineers in sticking to the former. His own opinion was, that whatever money they had to spend was best spent upon the holder itself, and, if they did not obtain the support required by trussing, they could do it in some other way. He did not altogether agree with Mr. Anderson in his utilitarian views, but he did agree with him in opinion that gasholder columns ought not to be strictly designed upon architectural notions, and he felt that great credit was due to Mr. Wyatt for having got rid of Doric and Tuscan columns. Still, he hoped that beauty of design would be studied as far as possible.

Mr. BROWNING said his experience at Plymouth justified him in stating that there was nothing like a good stout column to keep a gasholder in proper position.

Mr. DOUGLAS (Waltham) said he could never see the use of trussing a crown. If the weight of the trussing were added to the sheets a much better gasholder would be the result. He had no doubt that the use of trussing would be abandoned in a few years, but it seemed as though no one liked to initiate the change. The truth was, neither engineers nor contractors cared to incur the responsibility which they feared the change might involve.

Mr. SYMS (Rochester) said he had a holder in which three out of the ten truss framings were broken, and yet the holder worked as well as ever.

The PRESIDENT said the subject had been very well treated, and, as in the case of the tanks, one speaker had answered another. The point, after all, seemed to be the question of cost. Some of the friends had been speaking against facts. There was the fact of the Bow Common holders, and the remark was made to him (the president) some time ago by a London engineer, who said: "I saw Mr. Harris the other day, and I said to him, 'You have one set of holders with frames like spiders legs, and another surrounded with a complete forest of columns. Which is right? They cannot both be right?' 'Well,' said Mr. Harris, 'the lighter ones have worked admirably—there has never been anything the matter with them.'" Against facts of that kind there could be no valid argument. Mr. Wyatt said something about the supporting of a gasholder at four points only. He (the president) did not think it would be wise to increase the strength of the holder, so as to do with only four points. The plan suggested by Mr. Woodall seemed to be an admirable one. He constructed his holders at a less cost than others in a like position, and if his work was successful there seemed to be no reason why it should not be adopted. Mr. Douglas seemed to have hit the nail on the head when he said gas engineers were so conservative—they had been so long used to one system, and they did not like to make an alteration. Something had been said respecting a gasholder at Beckton, which held 1½ million feet of gas. He had been informed that the cost of this holder on the girder plan was considerably in excess of the old system of trussing.

Mr. WOODALL, in closing the conversation, said that his object in introducing this question to the notice of the association was to continue the discussion raised upon the paper read by Mr. Anderson in 1868. The conversation had brought out many points of much interest; but there were one or two upon which he was disappointed, and they required further elucidation. He quite disagreed from the remarks made by Mr. Anderson, that the principal strain on the curb was that arising from a gale of wind. He believed that that force did not amount to much. The strain on any particular part of the curb was really hardly worth consideration, being only two or three tons; but he thought they would do wrong altogether if they disregarded the great strain which must be put upon the curb by the tendency of the sides to collapse during the upward progress of the crown. He had tried to find out some method of calculating that strain. No doubt as they diminished the amount of the rise of the crown so did they increase the strain, both upon the sheets themselves and the curb. He hoped it would be possible in a little time for him to do something in the way of a mathematical calculation of these matters; but that this was the greatest strain upon the curb, he had no manner of doubt whatever. In constructing the frame exhibited he was compelled to put columns, because the space available for the base of the framing was very circumscribed. He agreed with Mr. Anderson as to the advantage of bringing the centre of gravity lower down in great structures like this, especially in a case like that referred to by Mr. Douglas, where the gasholder swayed to the extent of 18 inches. He confessed that he had never seen such a thing himself, and should take care to keep away from a holder with such a tendency. Mr. Douglas spoke of the average pressure of a gale of wind as being from 10 lbs. to 15 lbs.; but it must be remembered that in erecting a structure of this kind, they had to provide not for average but for the extreme pressure to which it might be subject. Mr. Wyatt spoke of the strain on the top curb being principally exerted while the holder was rising, and he stated that as it rose it drew the guides in from the framing, and the carriages left the columns. He (Mr. Woodall) must say, with regard to the two holders which he had used as texts, the sides of the upper lift were perfectly perpendicular, and he did not think that from the time the holder was inflated the carriages had needed adjustment. That being the case, he did not see how Mr. Wyatt could be right in saying that the disposition to draw in was most considerable when the holder was rising. That holders built upon Mr. Wyatt's plan would prove more expensive than those built upon the ordinary plan he did not for a moment believe. In fact, as compared with those shown on the plan, he thought they would be cheaper. The simple question was that of weight, and there was no reason why, weight for weight, the cost should be greater. But he must still hold the opinion that such a holder would be more costly than one built without framing at all. Mr. Wyatt had kindly furnished him with the weights of several holders which he would add to his paper. The holder at Newcastle, he thought, weighed 350 tons for 1 million feet of capacity, and the holder at Kennington 260 tons. There was a considerable weight, therefore, put into the sheets in addition to what was ordinarily provided. Mr. Douglas said it was preferable to spend money upon the holder itself than upon the trussing, which agreed with the remark made during the former discussion, by Mr. Hawksley, that if the two holders were to be made of equal strength, there must be a greater weight in the roof of the untrussed than that of the trussed holder.

The PRESIDENT said he could not but feel that Mr. Woodall had the best of the argument, though, owing to his conservative tendencies, he had not adopted the system.

Mr. JOHN WEST (Maidstone) read the following paper:—

IMPROVED METHOD AND APPARATUS FOR MANUFACTURING GAS.

The facts and principles which constitute the science of the distillation of coal, for the production of illuminating gas, have been well understood for years past by intelligent and practical gas makers. They have known that coal, when distilled at low heats, yields the greater part of its volatile matters in the form of heavy liquid hydrocarbons, and but little permanent gas which is rich in quality; also that, with an increased temperature of distillation, the gaseous products increase, while the liquid products decrease, until, at the highest workable temperature with clay retorts, the gaseous volume attains its maximum, although its quality becomes poorer.

It is also well known that by prolonged distillation at high temperatures impurities in the gas are produced—such, for example, as disulphide of carbon, which for the greater part is irremovable, in a practical way, by purification.

Further, it has been well known that if coal be distilled in thin strata a greater volume of gas is obtained, and that if the distillation be conducted under certain conditions the yield of gas will not only be greater than it is from equal weights of coal distilled on the usual plan, but the gas so produced will contain far less of the troublesome impurities.

Notwithstanding the general knowledge of these facts, the tendency during some years past has been in the direction of raising the temperature of distillation, with a view to obtain the largest possible volume of gas, and to compensate for its deficiency in illuminating power by mixing with it a proportion of the gas from cannel coal. This practice has been, so to speak, forced upon gas makers by the obligation to pay dividends and the absence of any system of distillation whereby the true, or at all events an approximation to the true, maximum in quantity and quality could be obtained.

It is not my intention to imply that efforts have been wanting to effect the distillation of coal in gas making in accordance with what I conceive to be the true philosophical method; on the contrary, for I am fully sensible that many men of high reputation have endeavoured to solve the problem. So far back as about 1815 or 1816, Clegg invented and put into operation his revolving web retort, in which coals were distilled in an exceedingly thin stratum at a moderate temperature. Other inventors followed in the same track, and, although

the construction of their distilling apparatus differed widely from Clegg's, the object was the same. The last illustration is to be found in Messrs. Porter and Lane's system, in which the coal, by means of an endless screw, is driven through a vertical retort. This system received the approbation of some gas engineers of repute, but it appears, in common with Clegg's and other inventions of the kind, not to have stood the test of prolonged working. These failures were not due to any fault in the principle of distillation, but to the construction of the apparatus, and the destructive effects produced on the materials of which the apparatus was made. Clegg's web system failed, if I have been rightly informed, by reason of the destruction of the iron web, the sulphur in the coals having acted upon it, forming a sulphide, which rendered the web brittle and ultimately unfit for use. The same thing, I understand, occurred with the screw of Messrs. Porter and Lane's retorts, which caused it to break into pieces after a limited period of operation.

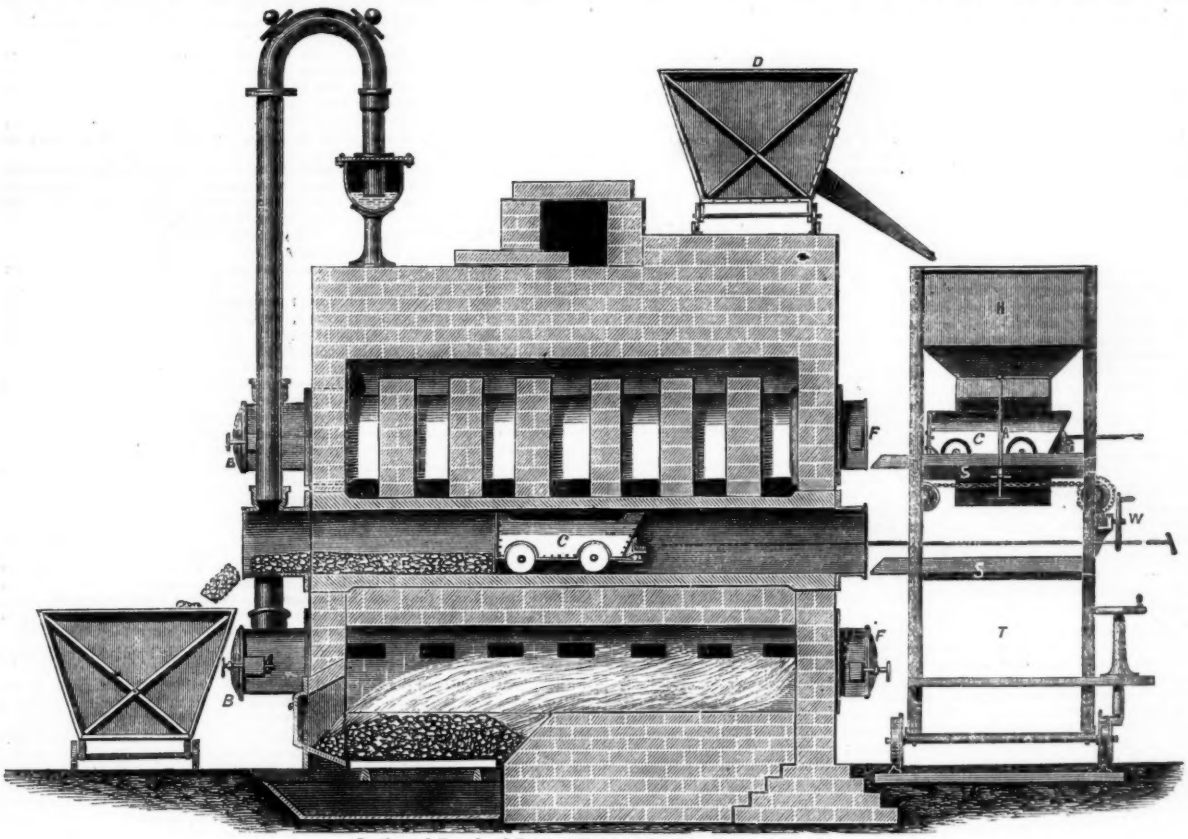
In addition to the evils pointed out in the system referred to, the coke was of a very light, friable, and inferior character.

By way of introduction to an exposition of the system I am about to bring before you, I venture to direct your attention to a few brief extracts from the works of competent authorities on the distillation of coal, with a view to render quite clear the principles by which I have been guided.

In the third edition of Clegg, page 122, it is said, "In all cases with the same degree of heat, the thinner the stratum of coal the better the gas;" and on page 128, "It is well known to every one connected with the manufacture of coal gas that a thin stratum is desirable. Chemistry points out the various causes and effects. The quantity of tar and ammoniacal liquor is much increased when the coal is acted upon slowly, as the centre portion must be when decomposed in mass."

Dr. Muspratt, in his excellent article on coal gas in "Chemistry as applied to Arts and Manufactures," says, "When compact masses of coal are thrown in heaps of 1½ cwt. (now most frequently 2 cwts.) into retorts heated to a bright redness, as is now done, they are exposed to two very different conditions—the surface of the mass, the exterior in contact with the intensely-hot retort, is instantly decomposed and charred. . . . As the heat penetrates to the centre, and a red-hot mass of charred material of considerable thickness comes to surround the decomposing coal within, as happens towards the end of the distillation, the whole of the hydrocarbons—namely, light oils, volatile hydrocarbons, olefiant gas, and even light carbide of hydrogen itself—that are eliminated are decomposed in passing over such an extent of heated surface, and pure hydrogen is almost alone evolved. The carbonic acid, which is formed from the union of the oxygen of the coal and of the air admitted with the carbon of the coal, is also partially decomposed during the whole of the process, but in an opposite direction; not by depositing carbon, but by taking up more, and being converted into carbonic oxide which is evolved with the gas. These are the true sources of the hydrogen and carbonic oxide in gas; they are not necessary results of the distillation, but products of the decomposition of distilled matter." He further says, "The affinity between carbon and hydrogen seems to diminish with the temperature," and, after citing certain chemical facts, asks, "Is it not reasonable to conclude that there is a temperature at which, in the process of decomposition, olefiant gas and volatile hydrocarbons should be formed, and which yet should be unable to decompose them into compounds poorer in carbon?" and expresses his opinion that there is such a temperature, and that it must be far below that at present employed. And Dr. Odling in his valuable lecture, delivered before this association in 1872, on "Sulphide of Carbon," said, "There is, I believe, little doubt that the chief proportion of sulphide of carbon found in coal gas is produced in the later stages of distillation."

Seeing that such are the opinions of men of high authority, and that men eminent as gas engineers have essayed to devise practical methods, although, as appears, not with complete success, in respect to enduring mechanism for distilling coal in the process of gas making in a scientific and efficient manner, after much thought upon the subject, I have devoted myself to the task of at least improving the ordinary system of gas production, and I will now place the scheme before the association as lucidly as my abilities will permit.



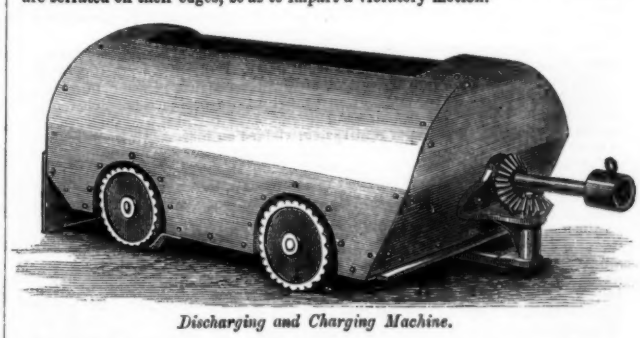
Section of Bunch of Retorts showing the Apparatus at Work.

The retorts employed are preferably D-shaped, and may be set five, seven, or more, as desired, in an arch in the usual way. Each end of the retort is open, and at each end there is a mouthpiece and lid, as shown at F and B in the drawing; but in single settings only one ascension-pipe is employed, which rises from the back mouthpiece, B. At D an overhead truck is shown, having an attached shoot. This truck is filled with coals by means of a very simple lifting apparatus, which, in my case, is driven by a band from the engine that does the other needful work. The truck, D, at the Maidstone works, runs on rails on the top of the retort-stack, but may, if necessary, run on a railway in the centre or at the side of the retort-house. T represents a trolly running on rails laid in front of the benches, provided at the upper part with a hopper, H, to contain coal also, with stages, S S, on which the "chargers," CC, to be presently described, rest.

At A is an arm and rod, by which a slide at the bottom of the hopper may be actuated and the coals allowed to fall through a vertical shoot into the charger, while W is a winch, by which to actuate a pulley and thereby adjust the stage, S, to the level of the retorts to be charged.

The hopper, H, which may be made to hold about a ton of coals, is charged from the truck, D, when requisite.

The charger is a wrought-iron carriage running on wheels at its side. Its bottom consists of a series of inverted V-pieces stretching from side to side, with ports between them, which ports are covered by the bars of a slotted slide, or by a series of five-bladed rollers, so as to prevent the issue of the contents of the charger until the slide is drawn forward or the rollers set in motion. At the ends of the charger there are iron bearings, in which rest a wrought-iron shaft, which traverses the length of the charger within it. To the back end of this shaft there is attached, by means of a cam or crank, a stout iron plate or slide, free to move upwards or downwards in guides attached to the back end of the charger, while the front end of the shaft externally to the charger terminates in a clutch, so that a long rod with a cross handle may be expeditiously attached or removed. The arrangement is such that if the plate at the back end be up, a half turn of the handle, and with it of the shaft within the charger, shall depress the said plate to such an extent that its lower edge shall be below the bed of the charger. In addition to this, however, the shaft is made, by simple contrivances, to perform another duty; for, on turning the handle of the rod back to its first position, the open spaces of the bottom slides are made to coincide with the openings in the bottom of the charger, or the internal rollers are thrown into gear, so that, when the charger is pushed or drawn a sufficient distance, its contents shall be distributed upon the floor upon which it runs. In order to ensure the delivery the wheels at the side of the charger are serrated on their edges, so as to impart a vibratory motion.



Discharging and Charging Machine.

From this description an impression may be produced that the apparatus is intricate in construction, and open to objection on the score of its liability to

become deranged. I believe that any such impressions, if produced by the verbal description, will be at once removed by an inspection of the charger itself, and an illustration of its action. In order that you may do this, I have brought a working machine before the association.

View showing the Ports at Bottom of Machine.

Supposing the hopper, H, to be filled with coals, and the charger to be resting on the stage of the trolly as at C—that the retorts have had their lids removed, and contain the coke of a previous charge—the first operation is to fill the charger, and to effect this the arm A is pushed upwards; the slide or bottom plate of the hopper is thereby removed from the opening, which it serves to cover, and the coals are free to fall through an attached vertical shoot into the charger below, which they do, and fill it in an instant. As soon as this has taken place, the arm A is drawn downwards, and the opening of the hopper again closed. The trolly is now placed opposite to the retort to be charged, the stage having been adjusted to the needful level, and the charger, with its ports closed, and the end slide at its lowest position, is pushed by means of the attached rod into the retort, driving the coke before it, and expelling it completely and cleanly from the retort, whence it falls into a barrow placed below. The back mouthpiece is instantly closed, and the man who works the charger then gives a half turn of the cross-handle, and draws the charger back, which delivers the coal in an even layer on the retort-floor, and finally reaches the trolly stage quite empty. The trolly is moved on to the next retort, the front lid of the charged retort fixed, and the operation repeated as many times as there are retorts to be charged at a spell.

All the operations just specified are accomplished with great ease and expedition at the Maidstone works. Three men and a boy are engaged. One man removes and replaces the lids at the back end of the retorts; another man does the same at the front; another man drives and works the charger; while the boy drives the trolly quickly along the rails with ease and promptitude from mouthpiece to mouthpiece. Such, indeed, is the speed with which the work is done, that not more than 50 seconds are occupied in discharging the coke from and recharging each retort with coals; but, before comparing this with the ordinary system, it is necessary to take into consideration the frequency of charging, and on this point experience has led me to the conclusion that charges of rather more than half the usual weight, worked for half the usual time, will be most advantageous; for not only must the quantity of gas be considered, but the quality of the coke must also receive due attention, for no scheme can be regarded as a practical one if this point be overlooked or ignored.

The number of men to be employed will, however, depend to some extent on the magnitude of the works; it would be possible for two men and a boy to perform all the operations needful, for as the back lids are refixed before the charge is put in, it would only be necessary to expel the coke from a few retorts, replace the back lids, and the second man would be free to attend to the closing of the front end. Indeed, it would be quite possible for one man and a boy to do the work with greater ease and advantage than with rake-drawing and shovel or scoop charging. In very large works a greater number of men than three might be employed with advantage, and the time during which the retorts are of necessity open still further reduced.

Another impression which may be produced in the minds of all who have not seen the system in operation is that the wear and tear account, in respect to retort and charging machinery, would be heavy as compared with the ordinary system; but my experience during some months of experimental operations enables me, however, to express a conviction that this would not be the case. Five clay retorts, with which the charger had been used for five months, showed no sign whatever of wear from the running in and out of the charger, and are in every respect as good as when first put into use; while the charger itself is as sound and substantial in every part as when delivered from the workshop. Indeed, to show how little the charger is affected by its exposure to the heat of the retorts, one was left in the middle of a closed and well-heated iron retort, from which a charge had been previously expelled, for some hours, and when taken out was found to be quite uninjured, and it has been in active use since.

In respect to the other parts of the apparatus, there is really no part of it which is exposed to much wear and tear, and all parts are both simple and substantial.

At the time I proposed to read a paper on the scheme, I intended and expected to be able in such paper to include statistics showing the results obtained by, at least, one month's working upon a large scale on the system. All that energy and effort could do to accomplish this has been done. My first working was with 5 D retorts, from which excellent results were obtained; but these have been taken down, and replaced by 14 retorts in two arches of seven each, in order that a more extensive and complete investigation might be made; but although the most strenuous efforts have been made, it has been impossible to complete them, and get them up to a sufficient temperature to distil coal in a satisfactory manner.

I am, therefore, obliged to confine myself to a statement of results and deductions arrived at by trials made by F. W. Hartley, Esq., in conjunction with myself, in January last, with the setting of five retorts just referred to. Two tons of coal, which with 5½ per cent. of cannel in the ordinary process of distillation yielded gas of an illuminating power of 14 candles, when worked off without any cannel on the improved system yielded an increased volume of gas of more than 10 per cent., possessing an illuminating power equal to that of the gas produced from the mixture of coals and cannel in the old process. Both the ordinary gas, and the gas produced by the new system, were purified by oxide and lime. Both were perfectly free from sulphuretted hydrogen, and no coloration was given to a turmeric test-paper exposed to jets of both gases; but the gas made on the new system contained only half the quantity of sulpho-carbons, although it was not subjected to scrubbing as was the other gas.

With respect to the residual products, the coke was greater in bulk, but of about the same weight as on the ordinary process, as nearly as could be ascertained, of most excellent quality, well fitted for general use, and for use in the furnaces, as appeared by the fact that the fires were kept up for half the time with it alone during the experimental trial, and no greater weight was used. This fact has been confirmed by workings afterwards with the new coke.

The quantity of tar and liquor could not be conveniently determined; consequently, this was left for after experimental trials, which, as already stated, I have been unable to have carried out.

Besides the consideration of the increased production per ton of coals carbonized, the better quality and purity of the gas, the excellent coke produced, the reduction of the number of the retorts required on account of the more efficient working of those in use, and probable reduction of wear and tear with this process, there is another all-important point to be dealt with—*i.e.*, that of the labour required.

With statistics to bring this before you, I must confess I am not prepared; for, working with a very limited number of retorts, no definite data could be fixed upon from which to draw deductions on this important subject.

I know it is a custom with some to show on paper savings of 50, 60, and 70 per cent. in labour with things which turn out complete failures. I am not disposed to do that, but I must say that the facility and ease with which the work can be done induces me, as well as others who have seen the system in operation, to come to the conclusion that there will be a very great reduction in the amount of labour required. Another remark I would add to this is, that in my opinion labourers receiving a lower wage may be easily brought in, as there is not that excessively laborious task of drawing and charging to be performed, which necessitated the employment of only men of very strong constitutions, on the ordinary system.

I have previously stated that the charges shall be somewhat heavier than half the usual amount, and that such charge will, as far as present experience enables me to judge, be worked off in half the usual time; and it is anticipated that, on this ground alone, there will be an increased yield per mouthpiece per 24 hours; and, if this be the case, the number of retorts will also, from this cause, be reduced, with the consequent saving in fuel account and wear and tear, to say nothing of labour.

The foregoing deductions in respect to labour and periods of charging are, of course, based upon what is really, in respect to a gas making system, limited data, and it might, on occasions, be advisable, under some conditions, to resort to two hour, or two and a half hour charges, with a less weight of coals per charge, but any such deviation from the plan indicated would not, in my opinion, affect the general results.

What I believe to be the best form of retort-bench for the working of the system is the one I have brought before you—*i.e.*, a short bench, open at both ends—but the system of charging can be adapted to all existing forms. When short retorts with back ends are employed, the light charges might be drawn with a rake immediately before the charger is brought in front of the retort, the men with the trolly and charger following on after the men drawing in quick succession.

For through retorts a trolly and machine on both sides of the benches would be required. In this case the coke might be drawn first in the manner indicated for short retorts with blank ends, or to be thrust out the whole length with one machine, which machine or charger is drawn back again, and is followed by the other machine to the centre, when both of them must be turned in gear, and delivering their charges, be drawn from the centre outwards on to their respective trollies, ready to pass on to the next retort, thus finishing their work simultaneously.

The system also enables us to use nuts or screened coal, which can be obtained at a much cheaper rate with advantage, and, when large coals are used, the cost of breaking them so as to present them in a proper form for distillation is very trifling, and is not worth a consideration, compared with the advantage derived.

The most important features in the system (as before indicated), however, are the enhanced volume of gas per ton, its increased luminosity, and its greater freedom from sulpho-carbons; and even supposing that practical working should fail to develop results to the full as good as those obtained experimentally, there remains such a margin of advantage that I have the fullest faith, from past experience, that the system will be found commercially valuable in a very high degree.

In respect to the cost of plant for working the system, as compared with the cost of plant of equal power for ordinary working, I am not at present prepared to make any definite statement, but must content myself by saying that, unlike many schemes which have been put forward for charging retorts by machinery or mechanical aid, it will not be attended by a large extra outlay of capital, the only extra cost necessary being for coal-lifting gear, overhead trucks, trolly, the rails upon which they run the charger, and the back mouthpieces and lids; and part, if not the greater part, of the expenditure on these will, according to my views, be saved by a less cost for retort-setting.

Another advantage of the system is that it can be readily applied to both large and small works.

Such, gentlemen, are the facts and conclusions arrived at in respect to my system. I place it before you under conditions much less favourable than I hoped to do, and should have done, had the result of a prolonged experimental trial been in my hand; but I feel sure that you will give it an impartial consideration, and whatever your verdict may be, welcome it as you welcome all efforts which are brought before you tending to the solution of the problem of how to distil coal for gas production, consistently with the truths of chemical science, and a due regard to commercial success. As soon as the new apparatus is ready, and experimental trials can be carried out, they will be made under the direction and control of gentlemen whose names and reputation will command your confidence; and the results will be published.

Mr. COCKEY (Frome) said all the members of the association were interested in the question brought before the meeting by Mr. West—the saving of labour in charging retorts. The president, in his opening address, when speaking of steam stoking, very properly alluded to the cumbrous nature of some of the machines invented for the purpose of effecting this simple object. But this paper referred to apparatus which could be employed in small works, and there were many things advanced by the writer well worthy of consideration. There were one or two little difficulties in connexion with it, however, that he would refer to. In the district from which he came they were accustomed to use a coal called rubble coal, which would require to be broken up into small fragments before it could be introduced into this charging apparatus. Then, again, the use of it would involve an alteration in the construction of the retort-house, adapted to the peculiar feature of this machine—the forcing out of the coke at one end of the retort while introducing coal at the other. Mr. West had supplied no information as to the comparative cost of working the two systems, and appeared himself only to have tried it upon a small scale. Therefore the commercial advantage of the invention was yet in abeyance.

Mr. BRUCE PEEBLES thought there was nothing new in the theoretical basis of the invention. In a very good essay from Mr. Innes a few years ago, the question was discussed as to the necessity of throwing very small portions of coal into the retorts if the best results were to be obtained. If this part of the paper, therefore, was disposed of, the invention was brought down simply to a mechanical stoker, and that was the only thing with which they had now to do. The only thing in connexion with the steam stoker that was objectionable, and seemed likely to oppose its general adoption, was the size of the machine. Steam could not be obtained without a boiler; it would be difficult to carry steam from a boiler through flexible tubes to the machinery, and therefore the boiler must travel with it. He agreed entirely in the remarks made by the president in his opening address, that the inventor of the steam stoker and the gentlemen who had endeavoured to overcome the difficulties in the way of mechanical stoking deserved the thanks of gas managers. The hydraulic stoker, which he had had the opportunity of seeing in Glasgow, was a machine of a different stamp.

The PRESIDENT reminded the speaker that Mr. West's invention, and not mechanical stoking generally, was the subject for discussion.

Mr. BRUCE PEEBLES said he saw nothing in Mr. West's invention except mechanical stoking, and he was contrasting the one system with the other. For himself, he could see no possibility of the apparatus now exhibited coming into actual operation. It was complicated, to begin with; then the coals to be fed into it must be first broken up small, the retorts must be improved, and the benches made suitable for its adoption. Besides this, the apparatus itself could not cost very little. From all he had seen he was inclined to the opinion that, if one thing in this direction was better than another, it was the hydraulic stoker to which he had referred. That machine certainly possessed advantages over anything he had ever examined, and amongst these he might mention the ease with which the charge was placed in the retort, and the short time which intervened between the discharge of the coke and the closing the lids after the fresh charge was inserted.

Mr. WARNER (South Shields), in opposition to the remarks of the last speaker, thought they must all admit that the writer of the paper had put before them the statement that the theory of the matter was not his own, and that all he had attempted was to provide a simple mechanical contrivance for spreading the coal in a thin layer along the bottom of the retort. For his part, he thought Mr. West had admirably succeeded in his endeavour.

Mr. HARTLEY (London) said he had been associated with Mr. West, as stated in the paper, in making experiments with this invention, and the only regret he had on the present occasion was that the members could not examine the apparatus for themselves. If they could, he was satisfied that every one who thought there was anything difficult in the working of it, or intricate in any of its parts, would have all doubts at once removed on seeing it in operation. For his own part, he entered upon an examination of the scheme, in conjunction with Mr. West, with some little distrust, but all distrust was speedily removed when he saw its actual working. He had had the opportunity of watching it for some months, and of being present an entire week to witness the performance of the apparatus. Unfortunately, even at that time, though the results were strikingly good, they were not of so complete a nature as would have been obtained under more favourable conditions. Hence Mr. West's desire to make fresh experiments on a larger scale in time to bring the results before this meeting. He had done all he possibly could to accomplish that object, but had found it impossible to do so. Undoubtedly, he had succeeded in obtaining an enhanced volume of gas from ordinary coal of the same illuminating power as was obtained by the ordinary process with a mixture of cannel. This was a great thing to begin with. In the next place, he got coke, which he had proved to be of satisfactory quality. That was another great thing, as too often the quality of the coke was sacrificed in getting an enhanced quantity of gas. As to the complexity of the machinery, there was really none; and, putting it in comparison with mechanical stokers of any description, it seemed to him to possess great advantages. He took it that the sole object of a mechanical stoker was to save labour, but here, in addition, there was an immense saving of coal effected. If, by this machinery, the work in the retort-house could be done with far greater ease and with less labour, while a greater yield per mouthpiece was obtained, more was effected than by the steam stoker, while the advantages were obtained without the disadvantages attending the complicated arrangements of that apparatus. Mr. West had brought before the association what he (Mr. Hartley) considered to be a very useful invention, and the paper in which he had communicated it was characterized by extreme modesty in its statements.

Mr. ELDRIDGE (Richmond) said Mr. Hartley had just given expression to the views he was about to lay before the meeting. Having seen Mr. West's machinery in operation, he could confirm all that had been asserted as to the results. Mr. Peebles had compared it with the hydraulic stoker invented by Mr. Foulis, and expressed an opinion in favour of the superior simplicity of the latter. He (Mr. Eldridge) had also had the opportunity of seeing Mr. Foulis's apparatus at work a short time ago, and, comparing the two, his opinion was that the merit of simplicity entirely belonged to Mr. West's, not only in the construction of the machinery, but in the ease with which it was worked. By simply driving the carriage into the retort, the whole of the coke was driven out, and by withdrawing the carriage, the coal was evenly distributed on the bottom of the retort. The carriage was made of the same size and shape as the retort, so that the latter was kept clean by the action of it, and there was no chance of carbon being formed therein.

Mr. METHVEN (London) asked as to the cost of fuel. It seemed to him that with small and frequent charges the fuel account would be rather high.

Mr. WATSON (Sydenham) said there could be no doubt the association were much indebted to Mr. West for his improvements in carbonization. But at that late hour of the day, and in the absence of figures, he thought it would be better to leave the discussion till another time.

Mr. KEY (Dumbarton) said he was sorry to differ in opinion from Mr. Peebles. He thought the invention before the meeting was the most efficient stoker they had yet seen, and he believed neither steam stoker nor hydraulic stoker could compete with it. The plan certainly deserved great consideration, if only for the fact that by one operation the discharging and charging of a retort was effected.

Mr. WARREN (Crewe) had had the opportunity of seeing Mr. West's machine, and must say that, as far as mechanical ingenuity was concerned, he was much pleased with it. It seemed to do the work for which it was designed in the most effective manner; but the point which struck him was whether, admitting the work was done in the most efficient manner, the results obtained were good. Admitting that 11,000 feet of gas per ton could be secured, was that compensated for by the bad quality (as he conceived) of the coke produced? In other machines of this kind, as in Clegg's revolving web retort, one reason of failure was the wear and tear of the apparatus, and another the inferior quality of the coke. In all such schemes, where the coal was laid on in thin layers, inferior quality of coke was the result. Mr. West stated that the volume of coke was increased, therefore its density must be decreased. He (Mr. Warren) very much doubted, considering the sample he saw, whether the quantity of coke produced would more than suffice to keep up the heats in the retorts. If that was the case the adoption of the scheme could hardly be made commercially successful.

Mr. HUNTER (Rochdale) regretted the paper was brought on so late in the day, after the expenditure of time, labour, and ingenuity bestowed by Mr. West on this invention. He (Mr. Hunter) had seen the apparatus in actual operation, and judging from what he saw, and from what he had heard during this discussion, he thought Mr. West had done himself more justice on his works than in the paper read on this occasion.

The PRESIDENT said he was very glad to have had this discussion, and his only regret was that the paper was necessarily driven off till so late an hour, for he felt certain that the subject itself, and the author of the paper, were both worthy of the fullest consideration that the association could give to them. On the question of the coke produced by the operation of this process, having seen it himself, he would make one remark. It was of course admitted at once that the coke was softer than the ordinary coke. The charges of coal were in the retort for about half, or less than half the time usually given, consequently the coke was much more friable; but he believed, the bulk being 50 per cent. greater, the amount received for it per ton of coal was quite as much as was received for coke when carbonization was conducted in the ordinary manner. The apparatus certainly struck him as being exceedingly simple and easy to work. He felt astonished at the facility with which the coke could be pushed forward, and the coal distributed in a beautiful and even manner.

The discussion then closed, it being arranged that Mr. West should be allowed to reply at the next sitting.

WEDNESDAY, JUNE 10.

At the opening of the proceedings this morning,

Mr. WEST (Maidstone) replied to some of the remarks made during the discussion of his paper. He said he was very much pleased with the way in which his statements were received on the previous afternoon, especially bearing in mind and agreeing in the observation made by Mr. Watson that he had no definite results to bring before the meeting. It was quite against his wish to present mere theories to the association, and he had strenuously endeavoured to get his process tried upon a large scale, so as to be in a position to show at least a month's working. However, from circumstances over which he had no control, this design had been frustrated. So disappointed was he at his inability to show practical results, that, though he had given in his name to read a paper on the subject, he would fain have withdrawn at the last moment; but it was thought desirable that the paper should be read, in order that members might have the opportunity of judging of the *modus operandi*. As soon as results were obtained they would be published. The first remark made on the previous day was by Mr. Cockey, who said he thought the system would be of advantage in small works. Undoubtedly it would be, but its advantages would not be confined to them. He was convinced that in large provincial works it could be introduced with great economy of labour and satisfactory returns; in fact, what could be done well on a retail scale could be done even more economically and beneficially on a large scale by this system. Mr. Cockey thought there was an objection to it, because, as he said, the coal would have to be broken up small. In this apparatus coal could be used that would pass through a 2½-inch mesh; of course, if coal in large lumps only could be procured it would have to be broken, and the additional labour must be added to the cost of working. The next remark was by Mr. Peebles, who could see nothing in the apparatus but a mechanical stoker. He (Mr. West) did not care what it was called. It had for its object certain duties, and those duties it could perform; and he was prepared to maintain, what he thought every one who inspected the model would see, that it was capable of doing much more than any mechanical stoker had done up to the present time. This one thing was certain, it combined the two operations of discharging and charging a retort at the same time, which no mechanical stoker hitherto invented professed to do. Beside that, he was not aware that mechanical stokers had attempted anything beyond putting the coal into the retort in the same way as was done in the ordinary course of things. This apparatus laid the coal on the floor of the retort in what was believed to be the most proper form for distillation, so as to secure the best results—*i.e.*, distributing it in a thin, even layer. By the old method of charging, the coal was sometimes 6 inches and sometimes 9 inches thick at the bottom of the retort; by this system the layer of coal could be varied from 1 inch up to the thickness of any ordinary charge. He had deemed it most advisable to study what would be commercially the best system; and by the course he had adopted he found that he could get an increase of from 10 to 12 per cent. in the volume of gas, and of the same illuminating power as could be obtained from the same description of coal with 10 per cent. of cannel, and could also get a larger bulk of coke. It was said by one of the speakers that new retorts would be necessary if this system were adopted. But any bench of D-shaped retorts would answer, and the machine could be elevated to any required height. As to the fuel account, the question put by Mr. Methven was answered in the paper, where it was stated that the same weight of coke, with this system, would give as much heat as the same weight of coke with the old system. Mr. Warren, who had seen the apparatus, was very pleased with the construction and all connected with the working, except the coke. He (Mr. West) had spent some little time upon the various questions involved in the adoption of the plan, and of course had had his doubts respecting certain things in connexion with the scheme before it could be considered as matured. This question of the coke was one of the doubtful points in his mind, and it was a point which could only be determined as the process was worked out in practice. He was happy to be in a position to state that that which he at first conceived would be a disadvantage had turned out to be an advantage. He had imagined that the coke would not be so good for the furnace, but he found that there was such a perfect combustion going on that he now believed he could get more heat from this coke than he could from coke made in the old method, weight for weight. Mr. Warren complained that the coke was not so dense; he (Mr. West) admitted it, but this was an advantage. Dense coke was better for some purposes, but then a stronger draught was required to bring the oxygen in contact with the carbon, and gas managers did not want strong draughts to cut their retorts to pieces. They wanted an even, slow draught, and he found that this took place in the furnaces using this coke, and a most perfect combustion was the result. The coke being more porous, there was a greater intermingling of the gases; there was less clinker, and not so much breeze in the ash-pan. Then, in reference to the quantity of coke for sale, a few facts were worth a large amount of theory. The coke which he produced from the five retorts during some months he sold at a reduced rate. He had on the new system a large yield of coke, and he sold it at from 3s. to 4s. per chaldron less than the ordinary coke; and yet he found, on calculation, that he received a larger per centage in money for this new coke than for the coke produced in the ordinary way. The quality of this coke for domestic purposes was excellent; it made the most perfect fire that could be desired, and the demand for it was so great that he never had a bit on the works. Gentlemen had it fetched away for use in their houses, and it was called "West's Parlour Coke." Ordinary gas coke was too dense to use in house fires, and this not being so dense, there would always be a demand for it in the neighbourhood, and thus gas managers would get a ready market for the product instead of having to convey it away to a distance. In conclusion, he remarked that all those who had seen his apparatus in operation had borne their testimony to its simplicity, and to the efficiency of its working, and he would venture to ask the indulgence of his brother managers for a little longer period until the settings he was now erecting were complete, and then results would be given by persons well able to judge, who would be called upon to test the scheme. At the Maidstone works he was going to erect eight more benches of seven retorts each, so that the process there would be worked out most thoroughly.

(*To be continued.*)

BURSLEM AND TUNSTALL GAS COMPANY.—The annual meeting of shareholders was held at Longport on the 19th inst—Mr. A. Sharp in the chair—when the following report was presented and adopted:—"The directors have much pleasure in presenting the following statement of accounts, which give evidence of the continued prosperity of the company. It must be confessed, however, that to a favourable coal contract is to be attributed much of the success which has been attained during the year, and that many circumstances, such as the increased cost of coal and all materials, reduced hours of labour at manufactories, and the early closing movement among the shopkeepers, combine to render the future success of the undertaking somewhat uncertain. The present contract for coal expires early in September, and, as the directors will have to pay a large advance for future supplies, probably amounting to 40 per cent., it becomes imperative upon the company to increase the price of gas to a charge of 3s. 6d. per 1000 feet from September 30 next. This increase will realize about £800 per annum, against an increase on the coal account of £1100. The directors have much pleasure in reporting the efficient condition of the plant throughout, and they have reason to believe that in the future the company's gas will attain a much higher standard of purity. The balance of profit amounts to £2936 16s. 1d., out of which sum your directors recommend payment of the usual dividends."

GASLIGHT ASSOCIATION OF THE UNITED STATES.

MEETING AT CLEVELAND, OHIO, WEDNESDAY, MAY 13.

After the delivery of the address of the PRESIDENT (Mr. W. H. Price) already reported, the minutes of the preceeding meeting were read, and a discussion arose upon the constitution of the association as to the eligibility to membership.

The PRESIDENT explained that, by the constitution, gas companies in their corporate capacity were eligible for membership, and were entitled, each one, to send three delegates to represent them at the general meetings. They might send their engineer, president, or any of their directors, or any of their stockholders if they pleased. The constitution also provided that individuals engaged in the business of making and distributing gas to cities and towns might also become members, whether acting under a corporation or not.

The SECRETARY (Mr. De Mill) read the list of members, when 56 gentlemen answered to their names.

The PRESIDENT called attention to the fact that there were several gentlemen present from Ontario who were practically engaged in making and distributing gas, and though, perhaps, strictly speaking, the constitution of the association did not admit of their becoming members, he hoped some way would be devised by which their co-operation could be obtained.

On the motion of Mr. NETTLETON it was resolved that the gentlemen referred to be invited to sit with the convention, and participate in all its proceedings except voting.

After the reception of one or two reports, and a conversation on the question of whether the members should have a supper in connexion with their periodical meetings—which was negatived—an adjournment took place. On reassembling, the reading of papers commenced. The first paper was on

THE MANAGEMENT OF GAS-WORKS.

By OSCAR G. STEELE.

Secretary and Superintendent of the Buffalo Gaslight Company.

I have been requested to prepare a paper on some subject connected with the objects of this association, to be read at this meeting.

I will make an attempt to do so, and regret that I cannot address you upon that portion of the declared objects which relate to construction and manufacturing.

My connexion with the business of gas-making has been of a business character only. I am not a gas engineer, know little of the science of construction or of manufacturing, except as incidentally acquired during a quarter of a century's connexion with the business department.

My position has been that of a gas company manager, and to this department I shall mainly endeavour to confine my remarks.

My connexion with the gas business arose from circumstances which might occur with any party.

When the subject was first agitated in our city, which was in 1847, I became interested in it as a great public improvement. The business was very little known in our State. New York had been supplied for some years, and Albany for a very short time. The movement to erect gas-works was looked upon with little favour as a business enterprise, although all appeared anxious to have it succeed, as a matter of public convenience and personal luxury. But, notwithstanding the general desire to have the city supplied with gas, and the streets lighted, few individuals were disposed to invest their money in what appeared to be so doubtful an experiment.

After great effort, a sufficient amount of stock was taken to justify the proprietors of the enterprise in going on with the works, although it was scarcely one-fourth of the amount necessary to complete them, ready for the transaction of business.

The chief motive for proceeding with the enterprise was public spirit, an earnest desire to obtain what was conceded to be a great public improvement. The science of the business, or the expectation of ultimate profit, had little to do with it for several years after its completion.

But a few years changed the relations of the business. The change from the oil, camphene, and candles was very pleasant; but the novelty soon wore away. Gas cost money as well as oil and candles, and the same spirit of economy required feeding as before. The gas supply could not be kept up without regular and prompt pay, a habit which, with a considerable portion of every community, is not easily acquired. And it soon began to be suspected that the public-spirited proprietors of this great public improvement, might possibly be making money out of it. Certainly those parties who risked their funds in the enterprise had a hope, at least, that it might eventually be a paying business. That this result has been reached by most of the gas organizations in the larger cities and towns is undoubtedly true; but as soon as it was popularly understood to be a success, the profits were greatly exaggerated in the public mind.

From that period, in the history of nearly every gas company in the country, the state of public opinion has been such as to render the management of a gas-work in a large city a labour of anxiety, which only those who have been identified with it can comprehend.

To the average citizen, the gas company was a great monopoly, making and distributing into every household an article which cost nothing, and who were inexorable in demanding pay for it. It mattered but little what the real state of the business was; it was sufficient that pay was demanded, and collected, or the supply would be stopped.

It never seemed to occur to parties that they still possessed the inalienable right to refuse to use the gas, and fall back upon the ancient and venerable privilege of using oil and candles, nor that even the dealer in oil and candles would also stop the supplies if his articles were not paid for. Nor did it occur to them that they might take the advice of Dr. Franklin to the citizens of Paris, when they complained of the great cost of candles, that they could go to bed at dark and get up at daylight, and thus avoid the intolerable expense of candles, circumvent the wax and tallow chandlers, besides greatly promoting their own health and capacity for industrial pursuits.

The "inherent right to grumble," which we have inherited from our English ancestors, finds ample room for improvement in everything relating to the gas supply. In no other department, except possibly taxes, is there such constant and universal complaint. Many people talk and act as if every penny paid to a gas company was extorted without consideration, and this feeling is without the slightest reference to the price charged for the article. The feeling is just as prevalent where gas is sold at a very low figure, as at a high one. The gas company are denounced all the same.

In England, where the supply of coal, cost of construction, and price of labour, enables the public to have gas at lower rates than in any other part of the world; there is the same chronic fault-finding as in countries where its cost is five times as much.

But great and unreasonable as is this feeling of dissatisfaction, there are many reasons why it should be so. Few people know anything of the detail of the cost of construction of gas-works, or of the process and cost of manufacture, and still fewer will take the trouble to investigate it in any respect. It is generally understood that it is made from bituminous coal, which costs from 5 to 8 dols. per ton, according to locality. It is also popularly believed that coal will produce from 8000 to 10,000 feet of gas per ton. The rapid conclusion is that a ton of coal costing 5 or 6 dols., produces 25 dols. to 30 dols. worth of gas, and the difference between the cost of the coal and the market value of the gas is all profit. It may seem strange among men of business that such an impression should exist; but it is quite universal, as every gas-works manager must be aware.

Other elements combine to create dissatisfaction. Very few consumers know anything of the principles and working of a gas-meter. Their bills vary somewhat for different terms, sometimes very widely, and they cannot understand why it is so. And when it is shown by examination of the meter that the statement is correct, then the accuracy of the meter is questioned. An offer to test the meter under the requirements of law is usually treated with contempt.

And then the system which must control the gas supply seems to many persons too rigid and arbitrary. The meter is the arbiter between the company and the consumer, and cannot with any safety be varied from. That the instrument is one of the most ingenious, as well as accurate, measures ever invented is well known to those who know its principles and the general accuracy of its work; but when its decisions do not sustain the views of the consumer, there is no language too strong to use in denouncing its infallibility.

That slight variations sometimes occur from improper location of meter, affecting the state of the atmosphere, is conceded; but they rarely work against the consumer, and when they do they are rectified without loss. But still there is the same doubt and mistrust prevailing to an unlimited extent.

All these things have to be met in a cheerful spirit. Nothing is lost by spending time in making explanations to parties disposed to fairly investigate, and it rarely fails to satisfy fair-minded men. But the great body of consumers still have their doubts and misgivings as to the fairness of the gas supply. The complaints often made partake of a ludicrous character. It is not uncommon for parties to complain that the gas furnished them is inferior to that furnished to their next-door neighbour, and they are obliged to pay the same price for poorer gas. Charges are also frequently made that the gas is diluted, or purposely made poor, to increase registration without increasing light, and so on *ad infinitum*. It is sometimes difficult to meet such contradictory and incongruous complaints, but it is one of the crosses which a gas manager has to bear, and must be met and endured with such Christian philosophy as poor human nature can command. It is an element connected with the business, and those who conduct it must discipline themselves accordingly.

But the general principles of gas supply should be well understood by us all, and we should be prepared at all times to meet freely and manfully the unjustifiable prejudice against us. Let us consider briefly the basis of our business, and the principles which underlie the whole.

In the progress of civilization the use of the night has been constantly encroaching upon that of the day.

In the early ages of the world day was day, and night was night. As the means of producing artificial light increased, the nights became more used for business as well as amusement, until a large portion of the night was turned into day by the improvements in producing artificial light.

From pine knots to wax candles was a great advance, but since, in the early part of the present century, the discovery of gas, and of its adaptation to every requirement of lighting, was made, all other methods of lighting have been suspended.

It became necessary for manufactories on a large scale to be created to meet the popular demand. The great expense attending it made it necessary to combine capital, by corporate organizations, as was first done in London.

The process of manufacture was, however, very crude, and great losses were incurred before permanent success was reached. This was finally accomplished by skill and perseverance. For some years the business was unprofitable, and only became profitable after great improvements in manufacture and distribution had been effected.

Its great superiority over all previous light soon brought it into general use throughout England, and has since worked its way into every civilized community.

As improvements were made, and gas came into general use, the profits of the business increased, and soon brought jealousies and competition, which have since been constantly connected with the business.

Every town where it was first introduced felt that it had made a great stride in providing for public wants and conveniences. But success in a financial way by the companies was not so agreeable to consumers.

Non-stockholders feared the companies were making too much, and every obstacle was thrown in their way. The nature of the business is such that progress is inevitable, and companies are obliged to look constantly ahead to provide for public wants. This serious necessity but increased the responsibilities of gas companies, and also the prejudices against them. Every scheme which could be devised by jealous or interested parties is eagerly seized upon to embarassr existing companies, and create by every means an unfair competition. The sympathies of the public are always with every effort at competition or embarrassment to existing companies.

The result has been almost constant warfare, compelling companies to protect themselves as best they could, while new companies, with the popular sympathy, pressed in every way possible to divide at least the profits of the existing companies. Many of these movements in large cities have been successful to the proprietors, who in the rapid growth have made a business for themselves.

But no instance can be shown where the public derived any benefit from the organization of a new and competing gas company. Division of territory or consolidation of interests have been the results in all cases, without permanent benefit to the city or to the citizens. It is not necessary to dwell upon these issues—they will work out for themselves.

The cry of monopoly is kept up persistently, and with some degree of plausibility. Let us look at this subject in the light of experience.

1. Gas companies are manufacturing corporations, for the purpose of making and selling gas to such as desire it, constructing their works and laying pipes, relying for remuneration on their ability to furnish light better and cheaper than by any other method.

2. Gas companies are organized under special or general laws, but have no monopoly, being simply authorized to make and sell gas. New companies can at any time be authorized upon the same territory.

3. No company possesses power to enforce the use of its light, or its continuance by any consumer any longer than is for his own interest or pleasure; and we are subject to competition from every other known method of lighting, or which may hereafter be invented.

4. They are, in short, manufacturing corporations, producing an article of prime necessity at lower rates than any other process, and are dependent for success upon this fact, and the judicious management of their business.

5. A gas-work, from its character, is a local institution, and can prosper only by identifying its own interests with that of the community. When once constructed, and its pipes laid, it cannot be removed, nor its business changed.

Such are the facts in regard to the status of gas companies. The charge of monopoly is therefore groundless. With this state of things the duty of managers of gas-works is to meet the wants, and even the clamour of interested parties, in a spirit of equal and exact justice to all.

Every precaution should be taken to manufacture and distribute gas of the best quality which can be made from the materials within its reach, and as near as possible of a uniform quality. The street pipes and fittings should be of the most perfect character, for the mutual benefit of the company and consumer.

In its supply of meters, which is the basis of all its business, no pains should be spared in obtaining those of the best quality for accuracy and permanency. Its testing apparatus for meters and burners should be perfect, and accessible to every consumer at all reasonable times, that every one can see for himself, if he desires it, the actual condition of meters and burners.

When any one desires an explanation of anything connected with his gas supply, give every attention to his request, concealing nothing from any one who really desires information.

In short, let us in all our dealings with the public or with individuals transact

our business on business principles, and do right at all times, regardless of injustice done to us. At the same time it is not required of us that we should do this in an apologetic or subservient spirit.

The making and selling of gaslight is just as honourable a business as any other in any community. It furnishes an article which is better than all others to every household and place of business on its lines of pipe, and at prices which command its use for the interest of every party who uses it. If not satisfactory, no one is obliged to continue its use.

This service is entitled to fair remuneration, like all other business. In short, the interests of the company and its customers should be mutual in gas business, as in that of all others, where buyers and sellers meet on common ground.

With these principles the business of gas lighting should be ranked among our permanent industries, and entitled to the same consideration as that of any other legitimate business. By following out strictly these principles of doing business, we shall command the confidence of fair-minded men in all communities, and with which we must endure the attacks of all others.

I think I do not assume too much when I say that the officers and managers of the gas companies, in all parts of our country, are composed of men at least as respectable and honourable as are to be found in any other branch of business. I have had personal intercourse with a large number of gas companies, and correspondence with many more, in this country and in Europe; and I have always found their officers and managers men of character and intellect, and of high moral standing in their communities. Certainly no other profession exhibits less of the demoralization of character, in the transaction of general business, than ours.

For this I claim nothing, for every man of any corporation should do right to the community from which it derives its business and patronage; but I do claim that in all the qualities which make good men and good citizens, the officers and managers of gas companies are at least the peers of all others. Let us in the justice and fairness of our business with the public, keep these principles constantly in view in the future as I feel assured we have done in the past.

The PRESIDENT: I am very sure every member of the association will feel very grateful to Mr. Steele for the very able paper he has read to us.

Mr. RANKIN: I move a vote of thanks be tendered to Mr. Steele for his address.

The motion was adopted.

DEPOSITION OF CARBON IN RETORTS, AND MEANS OF PREVENTING IT.

By GEORGE A. M'ILHENNY.

Engineer of the Washington Gaslight Company, District of Columbia.

Mr. President,—The subject on which I propose to make a few remarks is the deposit of carbon in retorts, and the means of preventing it. This subject, although, perhaps, the most important connected with the manufacture of gas from coal, has received the least consideration, but I am pleased to say that within the past few years more interest has been, and is being, manifested.

The accumulation of carbon as an incrustation on the inside of retorts commences with the distillation of coal for making gas, and no means have as yet been devised to *entirely* prevent it. Why it is that this subject has not received more attention has often astonished me. It cannot be that it could be forgotten by any manager of a retort-house who gave that part of his duties even a passing notice, because it is ever present, and its growth is a sure crop; it is like a vigorous cancer with regard to its constant growth and certain return. It may be called the pest of the retort-house and the torment of the engineer.

When it is removed it is sure to return, and again and again has this process of removal got to be repeated; in fact, it is as much of a duty and custom in some works as to draw and charge the retorts, and almost as important. Why this difference, apparent or real, towards a subject involving so much pecuniary interest? The only way that I have ever been able to account for it is the fact of the difficulties that stared every one in the face, without having the means to overcome them, and the natural tendency of men to shrink from difficulties that they have no reasonable hope of overcoming; and another class of men do not even take the trouble to inquire into this subject, but go on from year to year cleaning out their retorts, simply because it is the custom to do so in other places, and has been in theirs; and if I may be permitted so to say—this practice of carrying the corn to the mill in the manner of our forefathers is too prevalent in some gas-works at the present time. The cause of the deposit of carbon in heated retorts is attributable to the fact that when bituminous coal is subjected to destructive distillation by heat, it yields a great variety of vapours and gases, composed chemically of carbon and hydrogen; and having each one its particular condensing temperature, or degree of heat at which it changes from the aëriform to the liquid state, some of these having so low a condensing temperature that they remain gaseous when exposed to intense cold, while others require a considerable elevation of temperature to cause them to assume rapidly the condition of a gas. But there is another agency besides heat that can produce the condensation of these aëriform bodies, or make the liquid ones take a gaseous state, the temperature being the same—and this agency is mechanical pressure; and therefore these two agencies—heat and pressure—may co-operate or antagonize one another.

The greater the pressure under which distillation takes place, the greater degree of heat will be required to effect the vaporization; and conversely, the gaseous condition can be produced at a lower temperature, by lowering the pressure in the retorts.

If the volatile fluid and solid substances produced by distilling coal were placed in a pure state, or unmixed with other bodies in a retort, and heated properly, they would distil over and leave no residue in the retort; but if they were intimately mixed with some poor conductor of heat like clay, and then subjected in a retort to a quick action of the fire, some parts of the mass would become much more highly heated than others; the portion in contact with the retort, and the vapours from this part, tend to be disengaged, but as these vapours would meet with great pressure from the superincumbent and comparatively cool part of the mixture, they would tend to be recondensed and some only would escape.

The temperature still rising, a change would at length occur from this cause, and in the chemical affinities of the molecules of the volatile bodies, and new combinations would take place, in which a portion of the carbon—as that constituent which has the greatest tendency to be fixed—would separate and remain chemically uncombined, thoroughly disseminated intimately in a mechanical way among the particles of clay. Now, if the pressure in the retort and the heat should be sufficient, exactly what takes place in the interior of the mass would take place at the sides of the retort, where the vapours in a greater or less condition of rarity come in contact with the heated surface. The chemical affinities would be changed under the influence of the heat. New combinations would occur in which, by the law of definite proportions, fewer atoms of carbon would be required; and the superabundant atoms of carbon would then be deposited in a state of great purity and close aggregation.

The volatile compounds of hydrogen and carbon in coal are the only portion yielding gas capable of giving light when burned. Now it is well known that when the coal or any similar organic matter is distilled under a low heat, the carbon has a disposition to pass off with little hydrogen. This gas will be rich in carbon, but as the temperature rises the liquid carbide of hydrogen diminishes in quantity and the gaseous carbide of hydrogen increases. And as the heat goes on to increase, the hydrogen continues to increase, and the carbon to diminish; or the gas becomes richer in hydrogen and poorer in carbon. It is evident, therefore, that the deposit of carbon is caused by the combined agency of heat and mechanical pressure, the latter being the more powerful of the two.

It is well known to many persons here that in 1867 I contrived a means to prevent to as great an extent as possible the deposit of carbon in retorts. This is known as "M'Ilhenny's Vacuum Process." Previous to this I, like many others that were trying to make the retorts and coals yield good results, had a great deal of trouble from the accumulation of carbon. And knowing that successful experiments had been made by reducing the depth of the seal on the dip-pipes, I came to the conclusion that if the retorts could be worked without the *seal*, but very little carbon would be deposited. The theory on this subject to me is a very simple one, because it is manifest that if the gas can be removed whilst it remains in a state of vaporization, the carbon cannot be separated from the hydrogen. And it is a well-known law of organic chemistry that the higher the temperature, and the more advanced the decomposition of the substances, the simpler are the products. The affinity between the carbon and hydrogen seems to diminish. It would then be the natural tendency of the carbon to adhere to the heated surface of the retorts, but if the whole mass is removed before any separation takes place very little will stick. In order, therefore, to remove all obstructions from a free flow of this mass of vapours, it is necessary to have the mouths of the dip-pipes perfectly free from obstruction.

Clegg says, in his fourth edition, page 38, "That it is evident that the value of the gaseous and liquid hydrocarbons as light-yielding materials is in direct proportion to the quantity of carbon contained in a given volume. The densest of the gases or vapours are therefore those which possess the highest illuminating power." All the members of this class, however, as just mentioned, are more or less rapidly decomposed at a red heat, and in the usual process of gas making the inner walls of the retorts soon become covered with a layer of carbon derived from this source.

This destruction of luminiferous constituents is dependent, on the one hand on the length of time during which they are exposed to a high temperature, and on the other upon the number of the particles of such constituents which come in contact with the red-hot sides of the retorts.

Two methods, therefore, suggest themselves for the prevention of this decomposition. The first would consist of the rapid removal of the gases from the retort, and the second in the dilution of the luminous by an admixture of non-luminous constituents; for it is evident that the number of atoms of illuminating gas, in contact with a given surface, would only be half as great if that gas were diluted with an equal volume of hydrogen, as it would be without such mixture.

In speaking further on this theory, I am satisfied, and it must be apparent to any one having examined the subject, that the actual and immediate cause for the deposit of carbon in retorts is mechanical pressure; and when that is entirely removed, but very little, if any, carbon will adhere. When distillation first takes place on the inside of the retort, the vapours are in a heavy black mass, containing all the volatile portion of the coal. And this vapour is at a low degree of temperature, and only separates as the mass becomes more highly heated. And in this condition the atoms of carbon become condensed, and many of them adhere to the heated walls of the retort, and of course become separated from the mass of vapours. Now, it must be evident that if this entire mass were at once immediately removed, and passed in the ordinary way to the holder, those atoms of carbon would be carried by the volume of hydrogen and become an illuminating agent, instead of sticking to the inside of the retorts; and when it is considered that the value of the gas for giving light is in exact proportion to the amount of carbon it contains, this matter will be appreciated.

When clay retorts were first introduced, the great difficulty in their use appeared to be the amount of carbon that accumulated, because of the greater heat, under which they were worked. Owing to this fact, Mr. Grafton, at the Cambridge (England) works, commenced a series of experiments to ascertain the cause of the vast accumulation of carbon, and, without going into all the details of his experiments, I will simply give the results:—From 67 tons of coal 10 cwt. 24 lbs. of carbon was taken out, or 1 2-10ths per cent. of the weight of the coal carbonized. This was under a pressure; but, when he reduced that pressure, he found the amount of carbon was very much decreased.

Mr. Smedberg has written me on this subject, and I do not consider his any mean authority. I think, therefore, that it is unnecessary for me to go any further to prove this theory, as I am sure that every intelligent gas engineer will admit it. I will now give you what has been my own experience under the operations of the "Vacuum Process."

The growth of carbon inside of retorts forms an interesting study, and doubtless there are those present who have watched its formation with interest. Although the atoms are not visible to the eye, yet the formation can be seen to increase from week to week; and if allowed to go on without being removed, it will entirely choke up the retort. The formation is continuous, but the quantity in the retorts is entirely dependent on the frequency of its removal. I have seen it on all sides and top of the retort, and hanging from the roof like rocks from a cliff. It was my custom, before the use of my process, to clean out the retorts about every five weeks, but then the retort was very much impaired; two weeks before, and often several days after, leaky, so that I calculated that about three weeks embraced the entire time when the retort had its full capacity.

Now, in working the retorts with the "Vacuum Process," I make it a rule to clean them out every three months, but then there is less carbon than there would be under a pressure in three weeks. No carbon whatever collects on the roof of the retort, nor on the sides, nor in fact any part of it where the coal does not lie.

The exposed part is just as clean as the day the retort was fired up. It collects in the corners, and increases in thickness towards the back; this is owing to the fact that the vapours cannot get away as rapidly as where the coal does not lie, consequently become decomposed. The carbon adheres to the retort, but in my opinion if there was no obstruction such as the coal is, no carbon of any account would remain. If there was no advantage derived from the use of this method of working retorts, other than the prevention of the formation of carbon, it is of great value, in a monetary sense, as well as facilitating the operations of the retort-house.

What would be the feeling of relief to every manager of a gas-work, if he knew he could go on and charge his retorts from the time he set them until they were burned out. It has been fully demonstrated that retorts can be run from three to six months without cleaning, thus putting within the reach of every superintendent of a gas-work, the facility of having to clean out retorts from two to three times a year only, instead of ten times, as is mostly the case now.

I do not deny that the general management of a gas-work may not have something to do with this subject. In fact, I think that many companies make a grave mistake when they suppose that any man who can throw coal into, and draw coke out of retorts, understands the manipulations of the materials in the manufacture of illuminating gas.

Indeed, under this delusion, a great many companies are suffering heavy loss, and some large companies hundreds of thousands of dollars, per annum. In addition to the prevention of the formation of carbon, there is a very important advantage in the increased yield from the coal. This, of course, would be increased just in proportion to the yield under the pressure system.

We will take for example Penn coal, and admit that the company get 4 40-100ths cubic feet per pound of coal. Now if that yield can be increased to 4 80-100ths cubic feet, and the company carbonize 50,000 tons of coal per annum, the difference will be 44,800,000 cubic feet; or if the company use

25,000 tons of coal, then the increase will be 22,400,000 cubic feet. But now, suppose the yield to be only 4 cubic feet per pound. then the difference to the company using the 50,000 tons of coal would be 89,600,000, and the company using 25,000 tons 49,800,000 cubic feet. And so this scale goes up or down just in proportion to the amount of coal carbonized; assuming all the time that the gas be the same, or as good in quality. You will perceive, therefore, that these figures are indeed startling, but nevertheless true.

I suppose there are some present who have often wondered why it is that there is such a vast difference in the results of gas companies using the same materials; but such is the fact, there is a great difference. Now there ought not to be much difference, because the same facilities are at the command of all.

It is true, however, that the same appreciation of the necessity of making high efforts to be at the top, and taking advantage of all the circumstances that contribute thereto, are not always realized alike. Nor is it to be supposed that all have equal abilities any more than in other professions; but notwithstanding these facts, there should not exist the differences that now do, in the results of the various companies.

You will perceive that the saving does not end with the decrease in the quantity of carbon deposited inside the retorts, nor the increase of yield from the coal, but extends to all the incidental expenses of the retort-house; and this saving is in exact proportion to the increased yield from the coal and retorts.

It will doubtless be asked if there is not some difficulty in working successfully under this process; and in response I will say, that all that is necessary is to thoroughly understand the principle and the means of carrying it out—and there can be no doubt of success. I will admit that it is necessary to fully comprehend these points; but then it is to be presumed that every, or nearly every gas engineer fully understands these principles, and the mode of carrying them out. All the difficulties that encounter one in the use of this method are mechanical, and therefore easily overcome, if properly understood.

I am often asked if the exhauster has not to be carefully run. Yes, if the means of controlling its actions are not perfect, or nearly so. Now, with me there is no difficulty in this respect, because I have a governor that has perfect control over the engine, and when this is obtained (which is easily done), there is no more difficulty or risk than there is in the old system.

If coal continues to be the material from which gas is made, I am satisfied that it will not be many years before this system is in general use.

On the motion of Mr. WHITE, the convention tendered a vote of thanks to Mr. M'Ilhenny for his address.

CAN THE COMBUSTION OF COAL BE PROMOTED BY ADDITION OF WATER?

The conclusions arrived at in this paper, based on the supposition that the following equation represents the reaction between water and coal, $C + 2H_2O = CO_2 + 4H$ (the hydrogen being also burnt), may be given as follows:—

1. There is no increase of heat.
2. A loss of heat always follows addition of water.
3. Both the amount of heat and the temperature of the fire are considerably diminished.

It is thus of no advantage to use water for the purpose of caking coal, for a large amount of heat must be lost.—*Journal Chemical Society.*

IRON AND COAL TRADES OF SHEFFIELD, NORTH DERBYSHIRE, AND SOUTH YORKSHIRE.

(FROM OUR OWN CORRESPONDENT.)

There is little real improvement to record in the general state of the principal trades of this town and district.

Some of the foundries are beginning to experience a falling off of orders, while others, chiefly the larger works, are still turning out very good lots of general castings and pipes for gas, water, and steam purposes. One of these establishments has, it is understood, secured a moderately good contract during the past week at prices somewhat below those which have lately been current. Pipes are generally quoted at about £8 to £8 5s. per ton.

The steam coal trade of South Yorkshire is not very lively. At some of the pits stocking is going on, but at others the men decline to allow that procedure, on the ground that it would tend to defeat them in case the general strike results, as is expected in a few days. At some few collieries an arrangement has been made on an amicable basis. Messrs. Newton, Chambers and Co., of the Thorncliffe Iron-Works and Collieries, have reduced the price of their coal 2s. 6d. per ton at the pit mouth, and a similar reduction has been made by some of the firms in the Barnsley district. Steam coal averages still 10s. 6d. to 12s. 6d. per ton at the pits.

In consequence of the settlement of the Cleveland miners strike, foundry pig has dropped 7s. 6d. to 10s. per ton, quotations being (for g. m. b.), No. 1 foundry, 72s. 6d. to 75s.; No. 2, 68s. to 70s.; No. 3, 65s. to 67s. 6d.; No. 4, 58s. to 60s.; No. 4 forge, grey, 60s., M. 50s. and W. 48s. per ton. Yorkshire black pig is also a trifle easier.

At a special meeting of the Ilkeston Gas Company, held on Monday, tenders for enlargements of works were received. For brickwork, excavating, &c., the tender of Mr. Shaw (Ilkeston), £1430, was accepted, and for gasholders, condensers, valves, H and other pipes, &c., the tender of the Thorncliffe Iron and Coal Company (Newton, Chambers., and Co.), at £1400, was accepted. The pipes will be made by the Clay Cross Company, the total cost to be £4000. Mr. B. Wilson, secretary to the company, is the architect or engineer for these extensions. The Chesterfield Water-Works Company have issued notices cautioning persons against improperly wasting the water supplied by them.

The offices of the Sheffield Water-Works Company were struck by lightning on Wednesday, and a chimney over the rooms lately occupied as the engineers offices was demolished. The lightning was so vivid and pervading, that Mr. Ashton (manager) received a slight shock, but was not injured or prevented from proceeding with business.

THE NORTHERN COAL TRADE.

(FROM OUR OWN CORRESPONDENT.)

Last week was what is called the pitmen's "Derby." It was Newcastle race week, and very few pits did much work between Tuesday and Monday. There was little business transacted upon 'Change either, and though there was a much more ample supply of tonnage import than on the previous week, few engagements were entered upon. The strike of the iron miners has been settled. But it will be fully a fortnight before the Cleveland mines are at full work. In the meanwhile there is no urgency for any large supply of ironstone, as the general tone of the iron trade has not been so depressed for several years as it is at present. The same report must be made of the gas coal trade this week as last. It is quite as flat as the manufacturing coal trade. Prices are low, but these do not bring active business into the open market, and inquiries are extremely limited. Of course a considerable quantity of the best qualities of gas coals have been previously sold under contract, and it is as it were the residue that is generally in the open market; but gas coals have not been so abundant for a very long time as at the present period, nor have colliery owners been so keen to enter upon new business. The steam coal trade of the Tyne, whose quotations have been kept above the other classes of coal, after the extra demand for the Continent and East Indies has ceased, is experiencing a reaction; and it is thought that a further reduction will have to take place in prices before an active business is again done. There are large stocks of nut coals at the steam collieries.

The rates of freights were not much altered last week. From 6s. to 6s. 6d. to London was the quotation; Sandwich, 7s. 6d.; Plymouth, £7 10s.; and other ports in proportion; but little business was done at these rates, on account of the collieries being off. Turns, as a rule, are shorter at the shipping places. The chemical trade of the north of England, for the first time within two months, showed satisfactory signs of improvement last week. Notwithstanding there are large stocks in hand at the principal factories upon the Tyne, the price of nearly all kinds of chemicals rose, and manufacturers were not disposed to enter into contracts very much in advance at the quoted rates. The price of most kinds of material used for building purposes having been somewhat reduced lately by makers, there has been a more active demand in the market, and the general manfacturing trade of the Tyne is livelier. Timber is decidedly easier to buy.

REDUCTION IN THE PRICE OF GAS AT BRIGHTON.—The Brighton (Old) Gas Company have intimated by public notice that on and after the 8th proximo the price of gas will be reduced from 4s. to 3s. 6d.

PETERSBURG AND VIBORG GAS COMPANY, LIMITED.—A petition has been presented to the Court of Chancery by the Patent Gas Company, Limited, for the winding up of the above-named company. The petition will come on for hearing before Vice-Chancellor Malins next Friday.

CHICHESTER NEW WATER-WORKS.—The foundation-stone of these works was laid on Wednesday last, by Lord Henry Lennox, who, in the course of his speech, said the supply of water was constantly under the attention of the Government during the present session.

TEMPORARY OFFICERS OF HEALTH IN THE CITY OF LONDON.—At the meeting of the Commissioners of Sewers, on Tuesday last, the Sanitary Committee presented a report, which was adopted, in which they recommended that, in consideration of the duties rendered to the commission and the public by Mr. Liddle and Dr. Tidy, jointly acting as medical officers of health for this City during the quarter of a year just ended, the court should pay to those gentlemen the same amount of salary as Dr. Letheby would have received—namely, £150—with thanks for their attention and valuable services in the temporary appointment they have so ably filled.

BRIGHTON WATER SUPPLY.—Owing to the excessive drought of the present year, the consequences of which have shown themselves exceptionally early, the water-works company have just issued a special report, in which they recommend the Brighton Town Council to erect an additional pumping-station at Goldstone Bottom, which lies about two miles and a half to the north-west of the town, in order to provide not only for the emergencies of the dry seasons and other contingencies, but also for the continually increasing demand for water. The cost of the proposed works, together with a new reservoir and main for the equalization and improvement of the services, is estimated by Messrs. Easton and Anderson, the engineers who have been consulted with reference to the matter, at upwards of £30,000.

OIL FOR LIGHTHOUSES.—Further correspondence has been laid before Parliament on proposals to substitute mineral oils for colza oil in lighthouses. A recent letter from the secretary of the Trinity House to the Board of Trade shows that it seems doubtful whether the saving of expense which was anticipated from the use of mineral oils will ever be considerable. The secretary writes: "The prices of colza are falling, and those of paraffin rising, and there is at present only 1s. per gallon difference between them, which, on 50,000 gallons (the amount of paraffin required for 1874), gives a saving of only £2500, against which the necessary expenses for building new stores and supplying new cisterns—apart from the conversion of the lamps, the item for which, as improving their capacity for burning colza, may be omitted—will leave no margin for some years; and now that, from colza being properly burned, paraffin has ceased to possess any superiority as an illuminant, the advantages in its favour are neither so large nor so numerous as they appeared to be a few years since."

LEEDS WATER-WORKS.—At the Town Council meeting, held in May last year, Alderman Joy, chairman of the Water-Works Committee, presented a report, in which, after detailing the progress of the works at Lindley Wood and Swinsty, it was stated that no progress had been made with the third or Fewston reservoir since 1871. The reason for the delay in the completion of the latter reservoir was that the committee found there would be a very large saving effected by delaying the construction of Fewston reservoir until the plant and other materials in use at the other reservoirs lower down the Washburn Valley were at liberty. Sufficient progress has now been made, however, with the works at the other reservoirs to permit of the resumption in the early part of July of the works at Fewston reservoir. The acreage in the watershed draining into the Fewston reservoir is estimated at 13,000, the capacity of the reservoir in gallons 870 millions, the acreage of water surface 156, and the depth 60 feet. The reservoir will be about 500 feet above the sea level, or 50 feet higher than the Swinsty reservoir, and 200 feet above the level of that at Lindley Wood.

WORCESTER GAS SUPPLY.—At the meeting of the Corporation Watch Committee on the 19th inst., the mayor (Mr. Goldingham) presiding, an account was presented from the gas company for £482 2s. 6d. for supplying the public lamps for the last six months. The offer of the company to supply the lamps on the same terms—viz., 70s. each per annum—for the next six months was accepted. A conversation then took place on the question remitted from the council as to whether it was desirable to open negotiations for the purchase of the gas-works. Mr. Woodward moved—"That in order that the city may be supplied with gas of the purest quality at the lowest price, it is desirable that the manufacture and supply of gas should be in the hands of the corporation, and this committee therefore recommend the council to open negotiations with the Worcester New Gas Company for the purchase of their works." Alderman Wood seconded this proposal, but it was lost on a division, the mayor giving the casting vote against it. The meeting then agreed to adjourn the discussion till that day fortnight. The illuminating power of the gas was stated to be 14·25 candles, and the hourly consumption of the public lamps 5·5 cubic feet.

EXETER WATER COMPANY.—The annual meeting of proprietors was held on the 23rd inst.—Mr. R. Sanders in the chair. The accounts presented showed a balance of £2273 0s. 2d., after providing for interest on debentures, and the committee of management recommended the payment of a dividend of 6 per cent., which was agreed to. The report detailed at some length the progress of the works in hand, which the committee state they have every reason to believe will be completed and in full operation within three months of this period. These works comprise:—1, a new water conduit from the Exe to Pynes Works; 2, the rearrangement and relaying of the mains and service-pipes from the present reservoirs to Mount Radford and Heavitree; 3, the construction of a high-level reservoir at Marypole Head, and the necessary mains and pipes connected therewith. By these arrangements a pure and uncontaminated supply of water from the river Exe, above its junction with the Culm, filtered under improved systems, will be distributed throughout the city and neighbourhood. The committee express their regret at the death of the clerk, Mr. J. Huxham, in January last, and considering that he had been in the service of the company for eleven years, and had left his widow and family in rather depressed circumstances, they felt themselves justified in presenting her with a donation of £100. In his room they had elected Mr. Tripe, who acted for many years as the managing clerk of the company's solicitors, and consequently was not only thoroughly conversant with the Acts of Parliament whereby the company were incorporated, but with the general duties of the clerk. They had every reason to believe that he would prove a most efficient and valuable officer, and consequently they strongly recommended his re-election. The report was unanimously adopted.

Register of New Patents.

3086.—Fottrell, J., Dublin, "*An improved composition for the manufacture of pipes and tubes, suitable for water at high pressure and as conduits for sewage purposes, gas, brine, and other saline liquors.*" Patent dated Sept. 20, 1873.

This invention consists in the manufacture (by fusion of the ingredients) of a homogeneous composition forming a concretion or artificial stone possessing all the qualities of hardness and durability of the natural substance, such composition to be employed in the construction of tubes for the conduit of water at high pressure, gas, sewage, brine, and other saline liquors, or in the manufacture of useful or ornamental forms by moulding or casting the same. When greater density or special sharpness in the castings is desired, pressure is applied to the moulds

The proportionate quantities requisite for making a certain quantity of pipes are as follows:—13 cwt. of finely powdered stone; 4 gallons of shale oil, or an equivalent having the same boiling point, or from which the more volatile oils have been distilled off; 2 cwt. of Trinidad bitumen; 2 cwt. of bituminous rock. The object of the shale oil is to enable the bitumen to penetrate the stone and unite the natural bituminous rock with the bituminous stone. The whole is intimately mixed and kept well stirred whilst boiling, till it comes to a certain consistency dependent on the purposes to which the substance is to be employed: it is then run into moulds previously prepared to give colour to the material.

3101.—Mewburn, J. C., 169, Fleet Street, London, "*Improvements in lighting railway carriages with gas, and in the apparatus employed therein.*" A communication. Patent dated Sept. 22, 1873.

The specification of this patent states that all systems hitherto in use for the lighting of railway carriages with gas are based on the principle of having the supply of gas, whether in a compressed or a non-compressed state, in one carriage only, in one or more vessels, from which the burners of the other carriages are fed. Besides the great loss of gas caused by the many connexions or joints which are unavoidable in the conducting-pipes, there is another great disadvantage, and this is that by the system in question the disconnexion of a carriage from a train, or the coupling on of another carriage, is always attended with difficulties, and therefore impedes the traffic on the railway.

According to this system, avoiding the drawbacks above mentioned, every carriage is lighted separately by gas, and in such manner that one carriage is quite independent of the others, and carries a sufficient quantity of gas with it to feed, say, 5 burners, for a period of 33 hours. This is accomplished more especially by the employment, in the first place, of oil gas of the strongest illuminating power, and which is very economical when in a highly compressed state; and in the second place by a gas pressure-regulator, which makes the reduction of the compressed gas at about 6 atmospheres down to the burning point (about 15 inches water column pressure) possible.

The regulator consists principally of a divided cast-iron vessel, of a metal dust receptacle, of a new and peculiarly combined regulating place and a regulating cone. The regulating place is made of bronze, and operating against it for shutting off the stream of gas is the regulating cone, made of 86 per cent. tin, 5 per cent. copper, and 9 per cent. antimony. Through the employment of the metal just described alone is it possible to attain a durable and absolute shutting off of the stream of gas; and it may be remarked here that when bronze is employed against bronze, or similar hard metals, the shutting off becomes imperfect owing to the atoms of dust, and besides, caoutchouc or other materials of a similar nature are soon destroyed by the carbon and hydrogen contained in the gas.

The regulator consists further of a lever connexion and of a new and peculiarly employed and prepared leather membrane. This membrane consists of the best sheepskin, made tight by being stretched in a solution of gutta percha and grease. Other membranes, whether of caoutchouc or any other materials, would be destroyed owing to the quantity of oxygen and hydrogen contained in the gas.

And, lastly, the regulator consists of a pressure spring of peculiar make, and employed for the purpose of constant regulation. The spring is made of two layers of watch-spring steel, and it is in connexion with the lever before referred to. By means of its proportionately great length it is in a position to fulfil the functions hereafter described. A direct pressure-weight would increase the vibrations caused by the driving of the train so much as to extinguish the gaslights instantly.

The apparatus for the regulation of the pressure on gas, when compressed gas is employed, has to fulfil the following functions:—The compressed gas passes the dust receptacle, goes through the channel of the regulating place against the new and peculiar regulating cone, then through the six passages of the conductor of the regulating cone, and fills the cast-iron vessel. Through the pressure of the gas streaming in, the leather membrane, and with it the lever connexion and the regulating cone, are raised, and the spring effects, by means of its tension, the pressure necessary for burning, and regulates the difference of pressure at the same time arising from the motion of the carriages. The oil gas being compressed to about six to eight atmospheres is kept in a reservoir; or, if considered necessary, there can be two reservoirs affixed to the bottom of the carriage, and which can be filled after a lapse of from 24 to 36 hours by means of a suitable compression pump at those railway stations where the gas is manufactured. The gas goes from this reservoir by pressure to the above-described regulator, which is likewise affixed to the bottom of the carriage, and issuing from the latter with the usual burning pressure, it is conducted by pipes to the sides and top of the carriage direct to the several burners.

3110.—Forbes, G. H., Broughton Rectory, Northampton, "*Improvements in the manufacture of compounds to be used as fuel.*" Patent dated Sept. 23, 1873.

Former specifications of improvements by the present patentee describe compounds of various substances with tar, pitch, or bituminous matter, which compounds, when burned, form a substitute for coal and other fuel. But according to this invention, when the said compounds have not been sufficiently burned to convert them into lime or cement, the unconsumed portions thereof are mixed with a fresh quantity of tar or bituminous matter, so that they may again serve as fuel. Another part of this invention relates to the addition of peat to the ingredients of the compounds described in previous specifications.

3119.—Michel, C., and Frager, A., "*An improved water-meter or apparatus for measuring the flow of liquids.*" Patent dated Sept. 23, 1873.

The arrangement of meter which forms the object of this invention consists, like all apparatus of its kind, of two principal parts, a motor or measurer, and a register. The measurer is founded upon the principle of the water-pressure machine, and is composed of two parallel cylinders, each forming two pump bodies or measurers. The two pistons which actuate in each cylinder are united to the same rod, which carries and directs a slide. This slide distributes the water into the neighbouring cylinder, so that each cylinder commands the distribution to the other. The mechanism and method of action adopted in order to realize this object is not described apart from the drawings.

3131.—Brady, H., Bishopstoke, "*An improved construction of apparatus for warming rooms, and for other heating purposes.*" Provisional protection only obtained. Dated Sept. 25, 1873.

This provisional specification describes an apparatus consisting of a casing, at the bottom part of which are one or more gas or other burners; above these burners is a partition; the space above the partition is kept about half filled with water. The gas and products of combustion from the burners enter a hot chamber surrounded by the water, and are then carried off by a pipe, which may be led to any part of the room required to be heated before terminating in the open air or in a chimney. The steam generated from the water is similarly conveyed by a pipe. The gas and products of combustion, the hot water, and the steam are thus all utilized in warming the room, or for other heating purposes to which the apparatus may be applied.

3138.—Beale, J., East Greenwich, "*An improved engine to be used for pumping gases, air, or fluids.*" Patent dated Sept. 26, 1873.

This invention consists of an engine composed of an outer casing or cylinder furnished with an inlet and outlet as usual in rotary engines. Within the outer casing three or more radial vanes or pistons revolve around a central fixed pin, the vanes and the central supporting pin being of the same length as the casing. The vanes are connected by rods or links with an equal number of pins projecting from a disc on an eccentrically placed driving axle which passes through a stuffing-box in one end plate of the outer casing for the application of power in any ordinary manner.

By the foregoing arrangement of the parts, on the revolution of the said eccentric axle the vanes revolve around the central pin in such a manner as to cause by their varying speed in relation to one another a constant inflow of gas, air, or fluid by the inlet, and a constant outflow of gas, air, or fluid by the outlet.

3158.—Rogers, J. E., Smethwick, "*Improvements in the method of working the valves of steam pumping and other engines.*" Patent dated Sept. 27, 1873.

According to this invention as applied to steam-pumps (and which would be similar in other engines) besides the ordinary ports employed to work the main piston, two auxiliary ports having communication with the valve piston in the steam-chest are used in addition, the main piston allowing the steam from behind it to enter these ports after it has passed them in its stroke. Each of these auxiliary ports is fitted with a small auxiliary valve, having its larger surface exposed to the steam as it enters down the ordinary port for working the main piston, and the smaller surface exposed to the action of the steam from the auxiliary port. By this arrangement it will be seen that these auxiliary valves are kept in their seats at whichever end the main piston may be receiving steam, but as it approaches the opposite end, and having passed the auxiliary port (that end being the exhaust, and there being therefore no pressure on the auxiliary valve from the ordinary port), the steam lifts it and enters on the valve piston, and drives it in the direction necessary, which motion is repeated as the main piston performs its stroke.

3171.—Boaz, W., Limehouse, "*An improved instrument or apparatus for stopping or closing tubes or pipes.*" Patent dated Sept. 30, 1873.

The invention, which is principally applicable to the stopping or closing of the tubes of locomotive, marine, and other boilers, surface condensers, and refrigerators, consists of a pipe and a rod, which are inserted into the tube to be stopped or closed, formed or provided at the ends with arrangements or contrivances acted on from one end of the tube. These when acted on fill the sectional area of the tube at each end thereof, that is to say, stop or close the tube, and thus in case of leakage or fracture the mischief arising therefrom will be confined to the tube thus stopped or closed.

3175.—Fischer, J., Ulm, Wurtemburg, "*An improved construction of meter for measuring water and other liquid bodies.*" Patent dated Sept. 30, 1873.

This invention relates to an improved construction of meter for measuring the passage of water and other liquid bodies, and consists of a circular box or casing in which a drum is caused to revolve in one direction only by the pressure of the liquid. The drum has two or more sliding plates within it, which are alternately forced outwards by the action of springs, and alternately drawn inwards by the action of a cam or eccentric fitted within the casing. The liquid enters through a nozzle, and forces the extended plate forward in a circular direction the plate carrying the drum round with it for about one half of its revolution, when the plate gets acted upon by the cam, and is drawn into its sleeve or pocket in the drum so as to bring its outer edge clear of a stop-piece arranged between the inlet and outlet ports. The axle of the drum is in connexion with a counting apparatus, and this registers the number of revolutions, and consequently the successive fillings of the casing. The cam is so made that as soon as the drawn-in plate passes the inlet port it becomes released, and shoots out under the action of its spring to occupy a position for the liquid to act against and force round.

3185.—Voigt, F. G., Kentish Town, "*Improvements in apparatus used in the production of gas from hydrocarbon liquids.*" Patent dated Oct. 1, 1873.

According to this invention a rotary pump is used similar to an ordinary wet gas-meter to force a stream of air into a gas generator in which liquid hydrocarbon is maintained at a constant level. The generator is divided into numerous compartments, and each compartment is divided into two by a horizontal partition just above the level of the hydrocarbon; the air passes backwards and forwards through each compartment.

APPLICATIONS FOR LETTERS PATENT.

2127.—Henty, G. A., Notting Hill, London, "An improved trap for cisterns." June 18, 1874.

2169.—Lake, W. R., Southampton Buildings, London, "An improved process and apparatus for making illuminating gas." A communication. June 22, 1874.

2185.—Gamboni, P., Harley Street, London. "Improvements in pumps or apparatus for raising or forcing air or water." June 23, 1874.

2197.—Newton, H. E., Chancery Lane, London, "Improvements in gas-burners." A communication. June 24, 1874.

2209.—Haseltine, G., Southampton Buildings, London, "Improvements in gas-engines." A communication. June 25, 1874.

GRANTS OF PROVISIONAL PROTECTION.

1824.—Bell, J., Wishaw, N.B., "Improvements in distilling coal shale for the production of oil and gas, and in the apparatus employed therein." May 23, 1874.

1944.—Howes, W. H., Curtain Road, London, "Improvements in means or apparatus employed in the manufacture of gas for lighting and heating purposes, part of which improvements is also applicable to gas-meters." June 4, 1874.

1952.—Tandy, G. G., Penge, and Dryden, J. A., Stewart's Lane, Surrey, "Improvements in lamps." June 4, 1874.

1957.—Hazlehurst, G. S., Runcorn, "Improvements in apparatus for pumping liquids." June 5, 1874.

1958.—Stacey, J. T., and Lace, A., Newbury, "Improvements in the construction and arrangement of apparatus for carburizing atmospheric air to be employed for illuminating and other purposes." June 5, 1874.

1959.—Hughan, W. H., Southport, "Improvements in the treatment of sewage, town refuse, and like matters to utilize them as manure, and in the production of an artificial fuel to be employed in the said treatment, and for other purposes." June 5, 1874.

1973.—Matthews, H., Bristol, "Improvements in apparatus for preventing the return or back flow of gas, water, and other fluids in sewers, drains, and other similar situations." June 6, 1874.

1978.—West, J., Maidstone, "Improvements in apparatus used in the manufacture of gas." June 8, 1874.

1983.—Dann, J. T., North Brixton, Surrey, "Improvements in the construction of apparatus for lighting, extinguishing, and regulating gas-flames." A communication. June 8, 1874.

1992.—Walker, W. T., Highgate, Middlesex, "Improvements in the method of working gas-purifiers." June 8, 1874.

2017.—Heale, H. W., Southwark, Surrey, and Gowan, E. D., Holloway, Middlesex, "Certain improvements in the manufacture and construction of taps or valves." June 10, 1874.

2026.—Harrington, J., Ryde, Isle of Wight, "Improvements in gaseliers." June 10, 1874.
2034.—Cliff, W. D., Wortley, near Leeds, "Improvements in machinery for making clay retorts." June 11, 1874.
2049.—Lack, P. J., Westmoreland Place, London, "Improvements in valves for regulating the supply of gas, and in other fittings connected with gas-burners." June 12, 1874.
2059.—Wilson, J. H., Liverpool, "An improved double-way supply-valve." A communication. June 13, 1874.
2060.—Perrett, E., Great George Street, Westminster, "Improvements in apparatus for filtering liquids." June 13, 1874.
2061.—Perrett, E., Great George Street, Westminster, "Improvements in the arrangement of bag filters." June 13, 1874.
2078.—Tipping, I., Manchester, "Improvements in the construction of lift-pumps." June 15, 1874.
2079.—Curie, P., Cornhill, London, "Improvements in the manufacture of anthracene." June 16, 1874.
2103.—Rafferty, T., Manchester, "Improvements in apparatus used in connecting service-pipes, cocks, and plugs to main gas-pipes." June 17, 1874.
2127.—Henty, G. A., Notting Hill, Middlesex, "An improved trap for cisterns." June 18, 1874.

NOTICES TO PROCEED.

499.—Underhay, F. G., Clerkenwell, London, "Improvements in bib-cocks or cocks for drawing off water." Feb. 7, 1874.
565.—Hazeldine, F., Borough, Surrey, "An improved valve or tap for liquids and other purposes." Feb. 14, 1874.
598.—Yarrow, E. H., Camberwell Park, Surrey, "Improvements in the manufacture of gas, and in the apparatus connected therewith." Feb. 17, 1874.
702.—Weston, J. H., Lansdowne Road, Surrey, "Improved means of and apparatus for purifying, carburetting, and increasing the illuminating power of coal gas." Feb. 24, 1874.
720.—Woodcock, J., Plymouth, "Improvements in valves for regulating the supply of water to cisterns or tanks." Feb. 25, 1874.
752.—Mallinson, J., Welwyn, Herts, "Improvements in cocks." Feb. 28, 1874.
810.—Weston, J. H., Lansdowne Road, Surrey, "Improved means and apparatus for increasing the illuminating power of gas in lamps and other mediums of lighting, portable and otherwise." March 5, 1874.
972.—Mirrless, J. B., Glasgow, "A new or improved pumping-engine." March 19, 1874.
986.—Burden, J., Birmingham, "Improvements in pressure-gauges." March 20, 1874.
1584.—Sugg, W. T., Vincent Street, Westminster, "Improvements in apparatus for regulating the supply of gas." May 5, 1874.
1944.—Howes, W. H., Curtain Road, London, "Improvements in means or apparatus employed in the manufacture of gas for lighting and heating purposes, part of which improvements is also applicable to gas-meters." June 4, 1874.
1992.—Walker, W. T., Highgate, Middlesex, "Improvements in the method of working gas-purifiers." June 8, 1874.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

4088.—Turner, F. W., Hanover, "Improvements in motors to be worked by gas and air." Dec. 11, 1873.
4160.—Forbes, Rev. G. H., Broughton, Northampton, "Improvements in the manufacture of gas and quicklime." Dec. 18, 1873.
4279.—Browne, J. C., Hampton Wick, Middlesex, "Improvements in apparatus for raising, forcing, and exhausting water, air, or other fluid." Dec. 30, 1873.
4285.—Beckett, W. H., Chelmsford, "Improvements in the construction of valves." Dec. 31, 1873.
4294.—Clark, A. M., Chancery Lane, London, "Improvements in the manufacture of gas and fuel." A communication. Dec. 31, 1873.
117.—Lightbody, W., Bow, Middlesex, "Improvements in lamps." Jan. 8, 1874.
121.—Benson, M., Southampton Buildings, London, "Improvements in pump-valves." A communication. Jan. 9, 1874.
153.—Foulis, W., Glasgow, "New or improved machinery or apparatus for charging retorts." Jan. 12, 1874.
205.—Newton, A. V., Chancery Lane, London, "Improvements in the mode of and apparatus for filtering, rectifying, or clarifying liquids and gases." A communication. Jan. 15, 1874.
403.—Lumley, T., Harborne, Staffs, "Improvements in steam-pumps." Jan. 31, 1874.
404.—Cherry, H., Handsworth, "Improvements in steam-pumps." Jan. 31, 1874.
1435.—Lowe, C., and Gill, J., Manchester, "Improvements in the manufacture and separation of certain mixed coal-tar products." April 24, 1874.

Notes and Queries.

J. M. writes: "I see by the Journal that many managers use their foul lime for luting the retort-lids. We have tried ours after sifting it with a two-eighths-inch mesh sieve. It is then so rotten and short that it will not stick on the lids unless mixed with new lime. Perhaps some of your correspondents can say what is the cause of its being so short. We have four lime purifiers—working always three, and keeping one clean for changing. Our lime in the first purifier is very black before it is changed."

"*Young Gas.*"—"Will some of your chemical contributors kindly give, by means of an equation, the action of common salt (Na Cl) upon the carbon deposited in retorts, during the process of scurfing by means of that material?"

J. J. writes: "An exhauster and apparatus for the manufacture of sulphate of ammonia. Would it be advisable for a company, carbonising about 1000 tons of coal annually, to incur the expense of the above?"

"*Inquirer.*"—"What quantity of gas will an exhauster pass per hour, with cylinder 2 feet 8 inches deep and 1 foot 8 inches diameter? and what horse-power engine would be required to work the same?"

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GWYNNE & BEALE'S PATENT IMPROVED GAS-EXHAUSTERS,

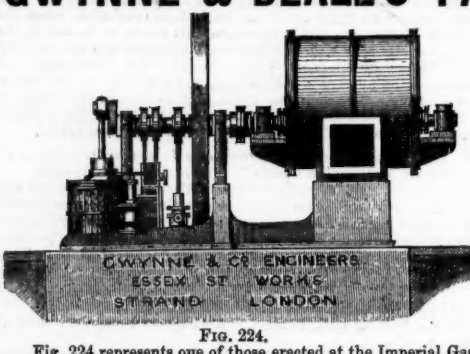

FIG. 224.

The BEST EXHAUSTERS IN THE WORLD.

Made under the personal superintendence of

Mr. BEALE,

The oldest Maker, Inventor and Patentee of

GAS-EXHAUSTING MACHINERY.

(It is NOT CORRECT to state that Mr. BEALE has RETIRED.)

Prices and every information on application.

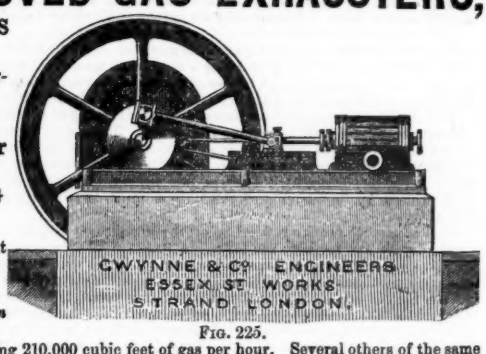

FIG. 225.

Fig. 224 represents one of those erected at the Imperial Gas-Works, Bromley, capable of passing 210,000 cubic feet of gas per hour. Several others of the same size are now on order for the same Company. These Patent Machines combine the highest quality of workmanship and materials, the largest bearings and wearing surfaces, with the **most perfect system of action yet discovered.** Fig. 225 represents one of a series of four at the Nottingham Gas-Works, each passing 52,500 cubic feet per hour. Gwynne and Co. *do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality, and the most approved design and arrangement.* Their prices have been estimated with a due regard to the **excellence of the article produced,** and when this is taken into consideration, they have no fear for the result. The orders executed this season for Exhausters and alterations to their patented system amount to over 4,000,000 cubic feet of gas passed per hour, and to over 300 horse power for Engines to drive them. In every instance their work is giving the greatest satisfaction. Numerous testimonials and references can be given.

REGULATORS, BYE-PASSES, STOP-VALVES, GAS-VALVES, & MACHINERY FOR GAS MANUFACTURE, OF ALL SIZES,
CAN BE HAD ON APPLICATION TO

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WANTED, a leading Stoker for a small Gas-Work. He must understand exhauster, and make himself useful. Wages 28s. per week.
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PATENT IMPROVEMENTS
IN
Apparatus for Manufacturing Gas.
Particulars to be obtained by application to—
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Engineer,
35, OLD BROAD STREET, LONDON, E.C.

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A Quantity of Bright Derbyshire Gas COAL, of excellent quality, having been carefully tested in practical working, FOR SALE.

For quotations, address Mr. W. A. PLUMBER, MANSFIELD.

PIPES.—A large stock of 3-in., 4-in., 6-in., and 8-in. Cast-Iron SOCKET and SPIGOT PIPES (usual weights) ready for immediate delivery, either f.o.b. or ex ship or steamer in the Thames.

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FOR SALE, the whole of the Plant of a small Gas-Work, capable of supplying from 200 to 300 lights, consisting of a Gasholder, 18 ft. diameter by 10 ft. deep, with inlet and outlet connexions, columns, pulleys, and counterbalance; Two Purifiers, 6 ft. by 3 ft. by 2½ ft., fitted with suitable covers, trays, and hydraulic valves; Set of Frame Condensers; 13-in. Circular Hydraulic Main; Ascension Pipes; Mouthpieces; Furnace Doors and Frames and Sight-Holes; and Three New D Iron Retorts, 15 in. by 15 in. by 7½ ft.

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Further particulars on application to the Liquidator, Mr. W. D. REDDISH, Swineshead, SPALDING.

Tenders to be sent in to Mr. Reddish, by the 16th of July, on which day they will be opened.

BARROW-IN-FURNESS CORPORATION.

THE Corporation are prepared to receive TENDERS for the construction of a RESERVOIR at Pennington, and also a Tunnel AQUEDUCT between the proposed reservoir and the existing reservoir of the Corporation at Poaka Beck, together with all works in connexion with the same.

Plans, sections, and drawings may be seen, and form of tender, bill of quantities, and specification be obtained at the Office of the Engineer, Mr. Frank C. Stileman, 33, Great George Street, Westminster, S.W., or at the Municipal Offices, Barrow-in-Furness, on or after the 30th inst.

Tenders to be sent in on or before Tuesday, the 14th day of July.

The Corporation do not bind themselves to accept the lowest or any tender. By order,

C. F. PRESTON, Town-Clerk.

Barrow, June, 1874.

FERNDALE GAS AND WATER COMPANY.

TO CONTRACTORS AND IRONFOUNDERS, &c.

THE Ferndale Gas and Water Company, Limited, Ferndale, near Pontypridd, Glamorganshire, solicit TENDERS for the various works to be done in the erection of GAS-WORKS.

The contract or contracts will comprise the excavation, masonry, &c., for a cast-iron Gasholder-Tank, the building of Boundary Walls, Coal Store and Retort-House, Lime-House, Purifier-House, Station-Meter House, Governor-House, Office, and other erections, together with all the Apparatus, 6-in. Connexions, and Street Mains requisite in the construction of such Gas-Works.

Full particulars may be obtained, and inspection of the plans and specifications, after the 30th inst., on application to the Company's Engineer, Mr. JOHN LEES COCKER, Gas-Works, Merthyr Tydfil.

Sealed tenders, to be forwarded to the undersigned, will be received up to the 18th of July proximo, endorsed "Tender for Excavation," "Buildings, &c," or "Apparatus," as the case may be.

Tenders may include the whole of the work to be done, but a separate sum must be stated for the excavation, the various buildings, and each portion of the apparatus and mains.

The Directors reserve the right to accept or reject any tender, whether the lowest or otherwise.

By order,

J. EDWARDS PRICE, Secretary.

The Court House, Pontypridd.

TO TAR DISTILLERS.

THE Directors of the British Gaslight Company, Limited, invite TENDERS for the purchase of the surplus TAR (about 200,000 gallons yearly) produced at their Norwich Station for a term of years, commencing on the 1st of January, 1875. The Tar to be delivered into tank barges alongside the Company's works.

Particulars may be obtained on application to the Secretary, at No. 11, George Yard, Lombard Street, London, where tenders will be received up to Monday, the 13th of July next.

The Directors do not bind themselves to accept the highest or any other tender.

FREDERIC LANE LINGING, Secretary.

Chief Office, 11, George Yard, Lombard Street, London, E.C.

TO MANUFACTURING CHEMISTS.

THE Directors of the British Gaslight Company, Limited, invite TENDERS for the purchase of AMMONIACAL LIQUOR (about 500,000 gallons yearly) produced at their Norwich Station for a term of years, commencing on the 1st of January, 1875. The strength of the liquor to be tested by saturation, and the liquor to be delivered into tank barges alongside the Company's works.

The tender to state what price will be given per ounce of strength, commencing at 6 ounces for each butt of 108 gallons, which price is to be subject to periodical adjustment, monthly or quarterly, according to the value of sulphate of ammonia in the London market.

Further particulars may be obtained on application to the Secretary, at 11, George Yard, Lombard Street, London, where tenders will be received up to Monday, the 13th of July next.

The Directors do not bind themselves to accept the highest or any other tender.

FREDERIC LANE LINGING, Secretary.

Chief Office, 11, George Yard, Lombard Street, London, E.C.

WALLASEY GAS AND WATER WORKS.

TO COAL MERCHANTS & OTHERS.

THE Wallasey Local Board are prepared to receive TENDERS for the supply of CANNEL and GAS COAL for their Gas-Works, and STEAM COAL for their Water-Works, for a period of Twelve months, delivered at the Works, Great Float, near Birkenhead.

Any further information may be obtained on application to the Engineer, at the said works.

The Contractor will be required to enter into a bond with approved sureties for the due performance of the contract, which contract and bond will be prepared at the expense of the Contractor.

Sealed tenders, addressed to the "Chairman of the Gas and Water Committee," and endorsed "Tender for Coal," to be left at my Office, Church Street, Egremont, near Birkenhead, not later than Three o'clock in the afternoon of Wednesday, the 15th day of July next.

The Board do not bind themselves to accept the lowest or any tender.—By order.

T. SOMERVILLE JONES, Clerk to the Board.

Public Offices, Egremont, June 22, 1874.

ROCHDALE CORPORATION GAS-WORKS.

TO IRONFOUNDERS.

THE Gas Committee invite Tenders for the supply of ordinary SOCKET and SPIGOT GAS-PIPES of the following dimensions, with turned and bored joints, cast vertically in lengths of 9 feet each, exclusive of socket.

Length in Yards.	Diameter in Inches.	Each Length not to Weigh More than cwt. q. lbs.	Each Length not to Weigh or Less than cwt. q. lbs.
1160	8	3 3 0	3 2 14
600	5	1 3 14	1 3 10

Any excess in the weight will not be paid for.

A recess or groove to be made in the Sockets for a lead joint if necessary.

The whole to be coated by Dr. Smith's process, and each pipe required to stand a pressure of 100 lbs. to the square inch, to be tested in the presence of a servant of the Gas Committee.

Parties tendering must be prepared to enter into an agreement binding them to deliver the whole on the road between Cutgate and Norden Church, within six weeks from receipt of order, in such quantities and places as required by the Engineer.

Tenders to be sent to me on or before the 7th of July next, endorsed "Tender for Gas-Pipes."

The Committee do not bind themselves to accept the lowest or any tender.—By order.

ZACH. MELLOR, Town-Clerk.

Town-Hall, Rochdale, June 25, 1874.

BRITON FERRY GAS-WORKS.

TO IRON FOUNDERS AND GAS APPARATUS MANUFACTURERS.

THE Gas Committee of the Briton Ferry Local Board of Health solicit TENDERS for the supply, delivery, and fixing, at their Gas-Works, Briton Ferry, of the undermentioned GAS APPARATUS:—

Six 15-in. diameter round retort mouthpieces complete, with 12 wrought-iron lids, cross-bars, screws, and lugs.

Six 6-in. equal ascension-pipes.

Six 6-in. arch-pipes.

Six 6-in. dip-pipes.

Two 6-ft. 2-in. lengths of 20-in. by 17-in. box-shape hydraulic main.

One vertical condenser, with 6-in. connexions.

One 3-ft. 6-in. diameter by 18 ft. high combined washer and scrubber, with 6-in. connexions.

One 6-in. "dry" centre-valve.

Four dry lime purifiers, 6 ft. by 6 ft. by 3 ft. 6 in., with wrought-iron plate covers, wood grids, lifting apparatus for covers, and 6-in. "dry" centre-valve, together with sundry 6-in. pipe connexions.

Copies of the specification, with conditions of contract and form of tender, may be obtained on application to Mr. John Lees Cocker, Gas-Works, Merthyr Tydfil.

Sealed tenders, endorsed, "Tender for Gas Apparatus," and addressed to the Chairman of the Gas Committee of the Local Board of Health, Briton Ferry, to be forwarded under cover to the undersigned, on or before the 18th day of July next.

Neither the lowest nor any tender necessarily accepted.

By order,

HENRY WILLIAMS, Clerk to the said Board.

Briton Ferry, near Neath, Glamorganshire, June 27, 1874.

GAS LIGHTING & EXTINGUISHING by GALVANIC ACTION and GAS PRESSURE.

NOTICE IS HEREBY GIVEN that the original English Patent for "Igniting and Extinguishing Gas," dated the 8th of December, 1870, granted to W. Lloyd Wise, of London, as a communication to him from Professor W. Klinkerfues, of the Royal Observatory, Göttingen, Hanover, together with all further improvements made by him, was sold absolutely in 1871 to John Billington Booth, Esq., of Preston, England, Chairman of the Preston Gas Company.

NOTICE IS HEREBY FURTHER GIVEN that the said Professor Klinkerfues and Herr W. Lambrecht, Electrician, of Göttingen and Vienna, have, by a letter dated the 6th of June, 1874, requested the said John Billington Booth to make known through the English newspapers *that he is the sole owner of the original English Patent* for "Igniting and Extinguishing Gas," as aforesaid; and that they are prepared and willing to render to him, or to any one he may appoint, every assistance, with their improvements and practical knowledge and experience, to make the said Invention a complete success.

The third year's tax on the above Patent was duly paid, and any attempted infringement will be carefully watched.

Information respecting the use or sale of the above patented Invention may be had from YATES W. BOOTH, Patent Agent, 2, Chapel Street, Preston.

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Is prepared to open the Books, and, if necessary, keep the Accounts of Gas and Water Companies.

To examine the Books and Accounts, and prepare Balance-Sheets for the information of Directors.

To assist Secretaries in preparing Balance-Sheets, according to the "Gas-Works Clauses Act, 1871;" or may be consulted with respect to Accounts generally.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.

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For further particulars apply to Mr. E. MADDOCKS, Manager of the Gas-Works, KETTERING.

The adoption of the above invention, without a licence from the Patentee, will be an infringement of the patent, and will subject the person or company guilty of such infringement to legal process.

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MANUFACTURE AND DISTRIBUTION OF GAS. These sheets are the same as were laid before the Dublin Meeting of the British Association of Gas Managers; but in the REPRINT, NOTES have been added for the guidance of those using them. Copies of the two sheets may now be had, price 5s.
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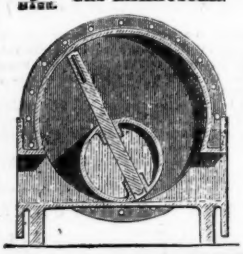
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COPY OF LETTER RECEIVED FROM MAGNUS OHREN, Esq.

To Messrs. John Wright and Co., Essex Works, Birmingham. *Crystal Palace District Gas Company, Lower Sydenham, S.E.*

Dear Sirs,—In reply to your inquiries, I am glad to state that the use of GAS COOKING AND HEATING STOVES has been a complete success here. We have several hundred in use in our districts. We also find it advantageous to let out Stoves at a small rental. We have now 275 Stoves at rent.

The Stoves you make I can with confidence recommend, having so many in use, and giving satisfaction. I need scarcely point out to you the advantage to Gas Companies to recommend the use of Gas Stoves to their Gas Consumers, even where they do not supply them on sale or rent, as the use of Gas Stoves brings day consumption, and thus the Company make a profit by day as well as by night.—I am, dear sirs, your faithfully, MAGNUS OHREN.

GAS COOKING STOVES

(PORCELAIN AND IRON).

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COOKING STOVES.

BREAKFAST COOKERS.

BATHS HEATED by GAS

GAS STOVES

For Boiling, Broiling, Preserving, Heating Flat Irons, and for all other Domestic purposes.

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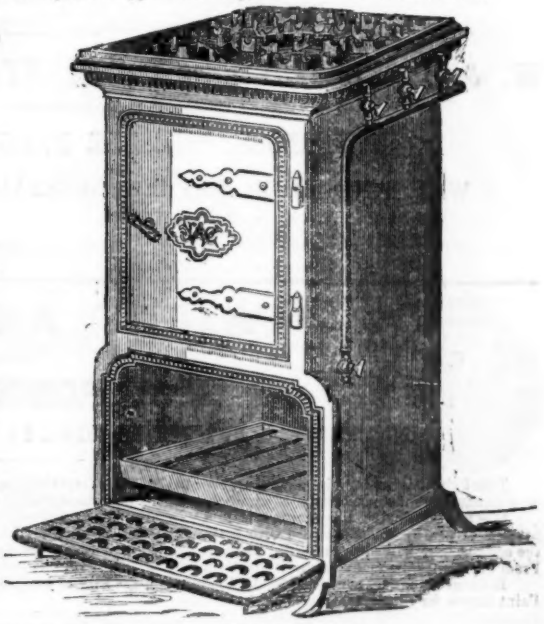
Price 50s., complete with Pan and Gridiron.



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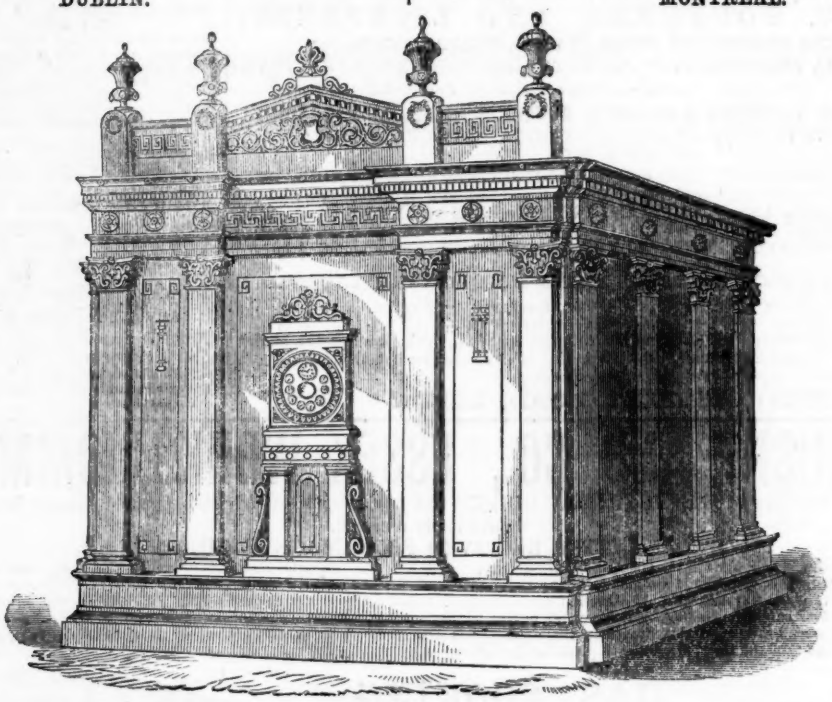
Messrs. R. MITCHELL & Co., Peter Street and Craig Street, MONTREAL.



W. & B. COWAN'S SQUARE STATION-METER with PLANED JOINTS.

GOVERNORS, PRESSURE REGISTERS, TEST GASHOLDERS, GAUGES, &c.

WET AND DRY METERS SPECIALLY MANUFACTURED FOR STREET-LAMPS.

PRICE LISTS ON APPLICATION.

1862.

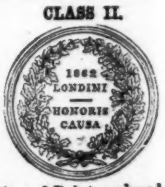
PATENT ANTIMONY PAINT.

MADE ONLY BY

GEORGE HALLETT & CO.,

296, ROTHERHITHE, LONDON, S.E.

CLASS II.



This Paint having been in general use over twelve years (especially in some of the principal Gas-Works), and proved itself the best light-coloured Paint produced for resisting the influence of vitiated atmospheres, it is important that its qualities should be more widely known.

It is not discoloured like white lead in a sulphuretted atmosphere, nor washed off like white zinc; and its light colour reflecting heat, produces much less expansion of gas in holders painted with it than with dark colours, besides rendering them much more sightly. Its specific gravity is so much below white lead that the same weight will cover one-third more surface, while it is equal in body; and its price being about the same (30s. per cwt.), it is actually one-third cheaper. From experience, its manufacture is greatly improved, and it is quite suitable for all purposes in which white lead is employed.

Reference is kindly permitted by the Engineers of the City of London, Commercial, London, and Surrey Consumers Gas Companies, who pronounce it the best Paint known for their purposes.

N.B.—Antimony Paint, COVERING SO MUCH MORE WORK, costs about 20s. per cwt., as compared with White Lead at 30s. per cwt.; a similar economy arises from its use in Steam and Gas Joints for which purpose it is superior to White Lead.

SPECIAL DRIERS FOR ANTIMONY PAINT SUPPLIED.

ALDER AND MACKAY,

GRANGE WORKS, EDINBURGH,

MANUFACTURERS OF

CONSUMERS IMPROVED GAS-METERS;

IMPROVED DRY GAS-METERS, in Cast Iron and Tin Cases,

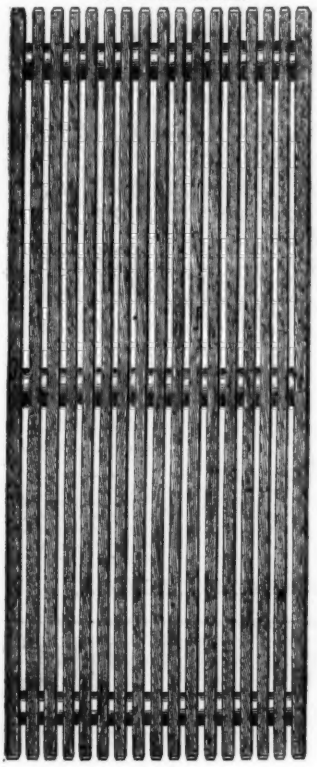
OF THE HIGHEST EXCELLENCE,

Warranted to measure correctly, and not to vary.

STATION METERS AND GOVERNORS,

EXPERIMENTAL METERS, PHOTOMETERS, GASHOLDERS, &c.

PLAN AND SECTION OF WOOD GRID, FOR PURIFIERS.



VERTICAL SECTIONS OF THREE KINDS OF WOOD GRIDS FOR SCRUBBERS.

PROUD'S

SPECIALITIES in WOOD

FOR

PURIFIERS AND SCRUBBERS

MADE FROM THE BEST QUALITY

OF

WELL-SEASONED PLANKS.

BROOKFIELD WORKS,

103, ICKNIELD STREET EAST

BIRMINGHAM.

MADE EITHER TAPER or PARALLEL
WITH SQUARE OR ROUND DISTANCE BLOCKS.

SCALE, ONE-FOURTH FULL SIZE.

Established

1795.

JOSEPH CLIFF & SON,

THE ORIGINAL

WORTLEY FIRE-BRICK WORKS,

NEAR LEEDS,

MANUFACTURERS OF ALL DESCRIPTIONS OF

FIRE GOODS, and Salt-Glazed Drain-Pipes.

LONDON WHARF:

Wharf No. 4, inside Great Northern Goods Station, King's Cross, N.;

LIVERPOOL—1, Back Leeds Street,

Where is always kept a Stock of Retorts, Fire-Bricks, Terra Cotta Ware, and Drain-Pipes.

THOMAS CARR & SON,
MANUFACTURERS OF
FIRE-BRICKS, LUMPS, TILES, RETORTS, &c., &c.,
SCOTSWOOD FIRE-BRICK WORKS,
NEAR
BLAYDON-ON-TYNE.

TO GAS COMPANIES, ENGINEERS, &c.
WOOD SIEVES.—WOOD SIEVES.
Estimates given and Contracts taken by the Manufacturer
GEORGE MACKANESS,
36, EDWARD STREET, HAMPSTEAD ROAD,
LONDON, N.W.
These Sieves are made with parallel or bevel bar, and guaranteed to be well seasoned yellow deal, and not common spruce so generally used.
N.B.—Specimens sent free on application.

B. CARPENTER,
THE ORIGINAL MANUFACTURER OF
WOOD SIEVES
FOR
GAS PURIFIERS & SCRUBBERS.
WORKS:
22, HERMES STREET, PENTONVILLE ROAD,
LONDON, N.

DEMPSTER'S
RENOWNED
WOOD SIEVES,
WITH TAPER BARS,
MADE BY MACHINERY
CAPABLE OF MAKING 10,000 FEET WEEKLY.
References to Hundreds of First-Class Engineers.
ROSE MOUNT IRON-WORKS
ELLAND, NEAR HALIFAX.

THE PATENT
CATOPTRIC LAMP
Is now in use in Moorgate Street, Cheapside, and Trafalgar Square, and has been in successful operation upon Waterloo Bridge since Oct. 7, 1871.
T. A. SKELTON, 37, Essex St., Strand, LONDON,
INVENTOR AND PATENTEE.

WALTER MABON & CO.,
Engineers,
ARDWICK IRON-WORKS,
FAIRFIELD STREET, MANCHESTER,
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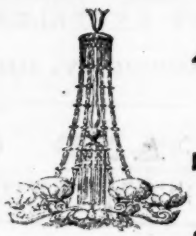
IRON TANKS, GASHOLDERS,
GAS APPARATUS,
PIPES, VALVES, IRON ROOFS,
WROUGHT AND CAST IRON GIRDERS.
DESIGNS, SPECIFICATIONS, & ESTIMATES FURNISHED.

GAS AND WATER PIPES.
WILLIAM MACLEOD & CO.,
18 & 20, ALSTON STREET, GLASGOW.

CAST-IRON GAS AND WATER PIPES.
MALLEABLE IRON TUBE FOR GAS, WATER, AND STEAM.
AGENTS FOR THOMAS GLOVER & CO.'S
PATENT DRY GAS-METERS.
DELIVERY F.O.B. ON CLYDE.
Lists on application.

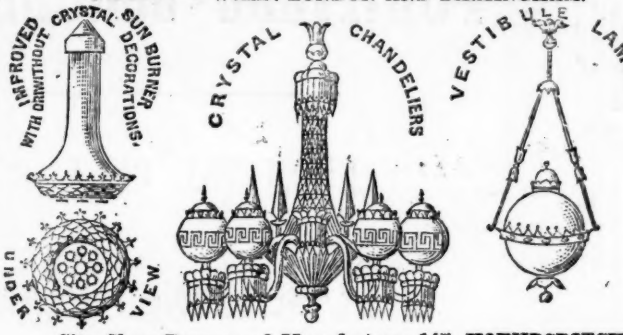
THE MIDLAND COAL COMPANY
Are prepared to enter into CONTRACTS with
CORPORATIONS & GAS COMPANIES
FOR SUPPLIES OF
GAS COAL & CANNEL.
Prices, Analysis, and other information on application at the
MIDLAND COAL OFFICES,
118a, OXFORD STREET, MANCHESTER.

ALFRED WILLIAMS,
PHŒNIX FIRE-BRICK WHARF,
64, BANKSIDE, SOUTHWARK, LONDON, S.E.
GAS ENGINEER AND CONTRACTOR FOR THE ERECTION OF GAS-WORKS,
AND FOR THE
SUPPLY OF RETORTS, FIRE-BRICKS, CAST-IRON MAINS,
AND ALL MATERIALS FOR GAS MANUFACTURE AND DISTRIBUTION.



F. & C. OSLER,
45, OXFORD STREET, LONDON, W.
MANUFACTORY AND SHOW-ROOMS:
BROAD STREET, BIRMINGHAM.
ESTABLISHED 1807.
MANUFACTURERS OF CRYSTAL GLASS CHANDELIERS,
WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES.
TABLE GLASS OF ALL KINDS.
CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS.

TO GAS COMPANIES AND THE TRADE.
J. DEFRIES & SONS,
MANUFACTURERS OF
CRYSTAL, BRONZED, & ORMOLU CHANDELIERS, IMPROVED CRYSTAL STAR & SUN LIGHTS, VESTIBULE LAMPS, AND THE PATENT CRYSTAL ILLUMINATION.
A LARGE STOCK ALWAYS IN HAND OF
IRON, BRASS, COMPOSITE, AND LEAD TUBES, FOR GAS AND WATER,
AND EVERY DESCRIPTION OF
GAS AND WATER FITTINGS.
THE PATENT DRY AND WET METER, WITH THE LATEST IMPROVEMENTS.
STREET LAMPS AND COLUMNS IN GREAT VARIETY.
WORKS: LONDON AND BIRMINGHAM.



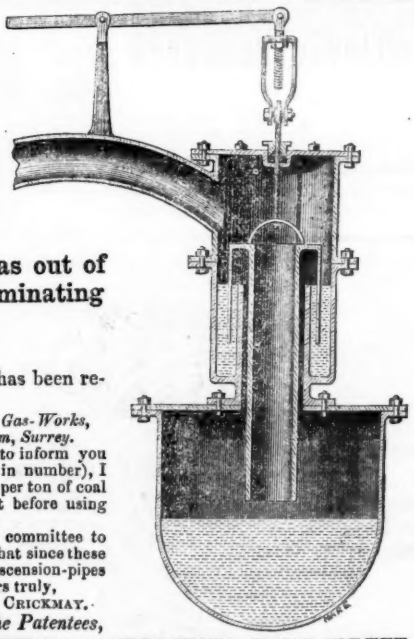
GAS MOONS,
Cut and Engraved, of the newest designs;
GAS REFLECTORS
In Silver and Glass;
GAS NIBS
AND
BURNERS
Of every description.

Pattern-Books of Gas-Fittings, Crystal and Ormolu Chandeliers for 1873, are now complete.

City Show-Rooms and Manufactory, 147, HOUNDSDITCH, LONDON.
ESTABLISHED 1830.

CHANDLER'S PATENT DIP-PIPE

The advantages are—
1st, There is no pressure on the Retorts.
2nd, No deposit of Carbon.
3rd, No scurfing required.
4th, Never a choked Ascension Pipe.
5th, Saves Fuel and Wear and Tear.
6th, Gets 10 per cent. more Gas out of the Coal, and a higher Illuminating Power.
7th, Is never out of order.



The following (among other letters) has been received:—

Engineer's Office, Metropolitan District Asylum Gas-Works, Caterham, Surrey.
Messrs. Chandler and Sons.

Dear Sirs,—In reply to your inquiries, I beg to inform you that since I have used your Patented Dips (ten in number), I find my make has increased over 1000 cubic feet per ton of coal carbonized, my usual make being 9070 cubic feet before using your Dips, and 10,150 cubic feet since using them.

I should add that I intend recommending the committee to adopt them throughout these works. I also find that since these Dip-Pipes have been fitted, I have had no ascension-pipes choked, which was before a great nuisance.—Yours truly,

Jan. 15, 1874. WM. CRICKMAY.

For terms of use and cost, apply only to the Patentees,
Messrs. CHANDLER & SONS, ENGINEERS & CONTRACTORS, YORK STREET, LONDON ROAD, SOUTHWARK, LONDON, S.E.

J. & J. BRADDOCK,

GAS ENGINEERS,

GLOBE METER-WORKS, OLDHAM,

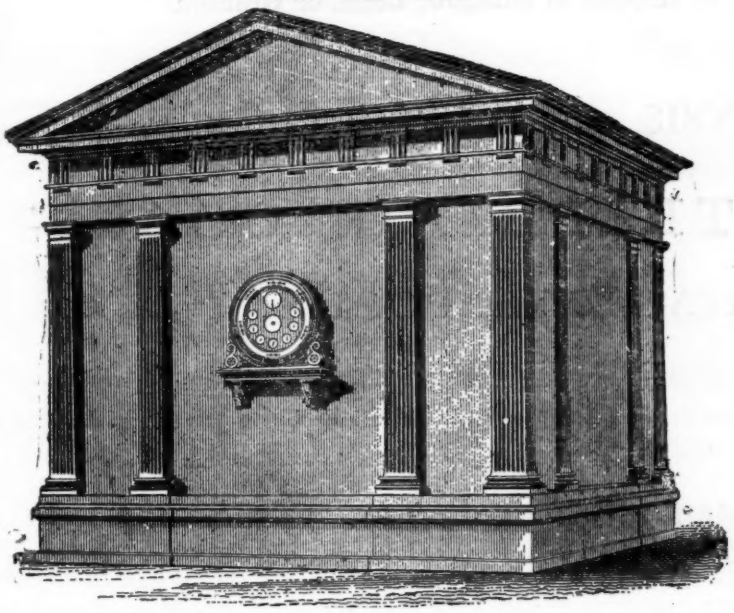
MANUFACTURERS OF

WET & DRY CONSUMERS GAS-METERS

OF THE HIGHEST EXCELLENCE;

ROUND STATION-METERS,

ON CAST-IRON STANDS.



SQUARE STATION-METERS,

WITH PLANED JOINTS.

GOVERNORS, GAUGES, INDICATORS, MAIN COCKS, &c.

GAS COOKING APPARATUS.

WATER-METERS SUITABLE FOR ALL PRESSURES.

Home and Foreign Orders promptly attended to.

All Sizes of CONSUMERS METERS, STATION-METERS, and GOVERNORS generally in Stock.

Orders almost invariably despatched on the day of receipt.

TERMS, &c., ON APPLICATION.

JAMES MILNE & SON,

GAS ENGINEERS,

Gas-Meter, Gas Apparatus, and Gas-Fittings Manufacturers,

EDINBURGH, AND

2, KING EDWARD STREET,

NEWGATE STREET, LONDON.

STATION-METERS, GOVERNORS, CONSUMERS METERS, GAS LUSTRES, CHANDELIERS, BRACKETS, &c.,

And every description of Gas-Fittings and Gas Apparatus.

CANNEL COAL.

ELLIS LEVER & CO.,

GAS COAL MERCHANTS,

107, PICCADILLY, MANCHESTER.

ALL CLASSES OF

ENGLISH, SCOTCH & WELSH CANNEL COALS.

CANNEL COAL.

COPPA COLLIERY, MOLD,

Beg leave to call the attention of Gas Companies to the superior quality of their

CANNEL FOR GAS-MAKING PURPOSES.

This Cannel produces in actual working, in iron retorts, 9200 cubic feet of 32-candle gas, and upwards of 11 cwt. of coke, and in clay retorts will produce 11,500 cubic feet of 25·9-candle gas.

Ports of shipment—Birkenhead or Connah's Quay.

Waggons supplied for delivery by railway to any part of England or Wales.

For particulars, prices, and rates of freight, apply to The Coppa Colliery, Mold, FLINTSHIRE.

THE

HUCKNALL COLLIERY COMPANY

Can offer a CANNEL COAL yielding a large quantity of Gas of superior quality.

Prices and information on application to the HUCKNALL COLLIERY COMPANY, Hucknall Torkard Collieries, near NOTTINGHAM.

POPE & PEARSON'S GAS COAL.—We have now the authority of several of the most eminent Gas Engineers of London in stating that our Coal yields *in practical working over* 10,000 *cubic feet of gas, with an illuminating power of* 16 *candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12½ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars, apply to POPE AND PEARSON, West Riding and Silkstone Collieries, near LEEDS.

SCOTCH CANNEL COALS.

The Subscriber is prepared to contract for the supply of all the principal SCOTCH CANNEL COALS. Prices and Analyses of the various Coals will be forwarded on application.

JAMES M'KELVIE,

CANNEL COAL MERCHANT,

HAYMARKET, EDINBURGH.

Established 1840.

THE

WIGAN COAL & IRON COMPANY,

LIMITED,

COLLIERY PROPRIETORS,

(Head Offices: WIGAN, LANCASHIRE;

District Office: 18, BENNETT'S HILL, NEW STREET, BIRMINGHAM,)

Supply the Best Wigan Arley Mine Gas Coal and Nuts; the Best Hand-picked Round Cannel;

ALSO SMALL OR GAS CANNEL, &c., &c.

OMOA GAS COAL.

THE OMOA AND CLELAND IRON AND COAL COMPANY, LIMITED,

ARE NOW IN A POSITION TO

SUPPLY FROM THEIR PITS AT OMOA

GAS COAL

OF A VERY SUPERIOR QUALITY.

This Coal, according to the report of the analyst, yields 11,110 cubic feet of gas per ton, and has an illuminating power of 33·97 candles per 5 cubic feet per hour.

Copies of the analysis and full particulars as to price, &c., may be had on application to the SECRETARY of the COMPANY, 172, West George Street, GLASGOW.

EVERY DESCRIPTION

OF

GAS COAL AND CANNEL

SUPPLIED BY

E. FOSTER & CO.,

COAL and CANNEL

MERCHANTS,

21, JOHN STREET, ADELPHI,

LONDON, W.C.

Prices Quoted on application.

LEE and JERDEIN,

COAL OWNERS & MERCHANTS.

Chief Office:

9, LANCASTER PLACE, STRAND, LONDON, W.C.

SOLE VENDORS FOR

LONDON & THE SOUTHERN COUNTIES

OF

WIGAN COAL AND CANNEL,

From the Mines of the

INCE HALL COAL & CANNEL COMPANY, Limited,

AND

Messrs. W. H. BRANCKER & Co.

WILSONTOWN GAS COAL.

This Coal bears a close resemblance to the Lesmahago seam. It has a first-class Coke, equal to the Lesmahago, and greater in quantity, and 10,538 Cubic Feet of 33·2 Candle Gas.

For rail in Scotland, or shipped at Glasgow, Leith, or Granton.

ANALYSIS AND REPORT

ON

CLIMPY TRIPPING COAL,

FOR GAS PURPOSES.

The results of this analysis, as shown below, were got from actual working, and we have therefore the utmost confidence in placing it, along with that annexed, before you.

COMMERCIAL RESULTS.

Gas per ton of Coal—temperature 60°—barometer 30 inches	10,200 cubic feet.
Coke per ton of Coal	1,400 lbs.
Durability of one cubic foot of the gas, by jet of 5-inch flame	48 min. 24 sec.
Illuminating power in standard candles	14·9

REMARKS.

Being well acquainted with Durham and Northumberland Coals, I have no hesitation in saying that "CLIMPY TRIPPING" is superior to any (containing, besides, a greater proportion of pieces from 7 to 14 lbs. weight), with far less impurities for purification, more gas, and coke equal in calorific power. It has a large mixture of cannel nuts, which accounts for the good quality of the gas, at our photometer in town, 1000 yards from the works.

It is also a very superior Coal for mixing with oils, as by Mackenzie's patent; or with acid tar, or tar oil, shale grease, or other refuse from paraffin-works, as by system of Mr. Scott, of Musselburgh, or Mr. Foster, Portobello, the Coal being easily crushed.

Below are the results realized by myself, when mixed with acid tar from paraffin work, received by me in a solid state, having been run on to very fine dross. My charges were 2 cwt. tripping and 28 lbs. of acid tar, each retort, running six hours; with lighter charges I get more gas, but not so good quality, or so much coke.

Gas per ton of Coal	10,800 cubic feet.
Coke per ton of Coal	1,540 lbs.
Durability of one cubic foot of gas, by jet of 5-inch flame	58 min. 28 sec.
Illuminating power in standard candles	27·29

The first truck received being tried with very light charges (unmixed), and running five hours, I got 10,500 cubic feet of 14-candle gas; and I am confident, practical managers, with good retort-fittings (mine being very inferior), and exhausters at work, as I have seen generally at home and abroad, will take 11,000 feet of 13-candle gas from it. My retorts are 8 feet × 2 feet × 14 inches, D shape, heavy dip, and no exhauster.

These remarks of mine you may perhaps think rather lengthy, but they will be the more intelligible to any manager inquiring for Climpy Tripping.

L. MONK,
Engineer and Manager.

Lanark Gas-Works, April 20, 1874.

GRAY AND PAUL,

WILSONTOWN GAS COAL WORKS & CLIMPY COLLIERY,

BY CARNWATH, N.B.

G. J. EVESON,

GAS COAL MERCHANT,

STOURBRIDGE.

Delivery per Rail to any Part.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
173, ST. VINCENT STREET, GLASGOW.

RUSSEL'S BOGHEAD.

MUIRKIRK, No. 1, CANNEL
Yields 11,600 cubic feet of 34·3-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash.

MUIRKIRK, No. 2, CANNEL
Yields 10,700 cubic feet of 32·77-candle gas per ton, and 9½ cwts. of coke, containing 11 per cent. of ash.

OLD WEMYSS CANNEL
Yields 12,550 cubic feet of 23-candle gas per ton.
Prices and full Analyses on application.

ALBERT GAS COAL.

THE DERBYSHIRE
SILKSTONE COAL COMPANY,
LIMITED,
CAN OFFER A
GAS COAL
Of superior quality, delivered at any station in England and Wales.

Purified gas per ton of coal in cubic feet (average)	10,775
Weight of coke in lbs. per ton of coal	1,465

ANALYSIS AND PRICES ON APPLICATION TO
Mr. EDMUND TAYLOR, Secretary,
ALBERT COLLIERY, NEWBOLD, NEAR CHESTERFIELD.

DUKINFIELD CANNEL COAL.

THE DUNKIRK COAL COMPANY.

OFFICES:
ASTLEY DEEP PIT, DUKINFIELD.

ANALYSIS, PRICES, AND OTHER INFORMATION, ON APPLICATION AT THE ABOVE OFFICES.

MESSRS. NEWTON, CHAMBERS, & CO.,
THORNCLIFFE IRON-WORKS AND COLLIERIES,
NEAR SHEFFIELD,
STRONGLY RECOMMEND A TRIAL OF THEIR
CELEBRATED SILKSTONE GAS NUTS.

Analysis by F. J. EVANS, Esq., Chartered Gas Company, Horseferry Road, Westminster:—

(COPY.)

	Cubic Feet of Gas per Ton of Coal.	Illuminating Power in Candles.	Coke per Ton of Coal used.	Ash in Coke, per Cent.	Sulphur in Coal, per Cent.
Silkstone Nuts . . .	10·800	15·85	12·66 cwt.....	6·0	0·69

NOTE.—The illuminating power of the gas was tested by the standard burner now used in London by the Gas Referees, under the City of London Gas Act, 1868.

Horseferry Road, Westminster, March, 1870. (Signed) F. J. EVANS.

These Nuts are extensively used by various Gas Companies throughout the Kingdom, who bear strong testimony to their value.

APPLICATIONS FOR PRICES, &c., TO BE SENT DIRECT TO THE COLLIERY, AS ABOVE.

CROLL'S
DRY GAS-METERS,

PRIZE MEDALS.
LONDON, 1851;
NEW YORK, 1853
PARIS, 1855.

(INVENTED & PATENTED IN 1844,)

COMBINING ALL THE LATEST IMPROVEMENTS,

MANUFACTURED ONLY BY

PRIZE MEDALS.
LONDON, 1862;
DUBLIN, 1865
PARIS, 1867.

THE GAS-METER COMPANY, LIMITED,

238, KINGSLAND ROAD, LONDON, N.E.

ALEXANDER WRIGHT & CO.,

MANUFACTURERS OF

"WET" & "DRY" GAS-METERS

of the highest excellence.

STATION-METERS AND GOVERNORS.

STREET-LAMP REGULATORS.

TESTING APPARATUS

of the most perfect description for all purposes relating to Gas.

NOW READY.

"GAS MEASUREMENT AND GAS-METER TESTING," by F. W. HARTLEY, A. Inst. C.E.
Third Edition, cloth boards, 2s.; per post, 2s. 2d.

55 and 55A, MILLBANK STREET, WESTMINSTER, S.W.

R. LAIDLAW AND SON,

EDINBURGH AND **GLASGOW.**

Manufacturers of

CONSUMERS IMPROVED WET GAS-METERS,

THE UNVARYING WATER-LINE GAS-METERS,

IMPROVED DRY GAS-METERS, in Cast-Iron or Tin-Plate Cases;

STATION-METERS, ALL SIZES, up to 15 feet Square, with PLANED JOINTS;

Experimental Meters, Photometers, Pressure-Gauges,
Governors, Test Holders, &c., &c.

LONDON OFFICE: 106, CANNON STREET, E.C.

"HOLBORN WORKS"

BILLING & CO.,

MANUFACTURERS OF THE

"REFLECTOR"

GAS COOKING STOVES,

THE "CHEERFUL"

GAS HEATING STOVES,

SUN BURNERS,

AND

GAS FIRES.

BILLING & CO.,

90, HATTON GARDEN, LONDON, E.C.

MANUFACTORY: HOLBORN WORKS, SMART'S BUILDINGS,
HIGH HOLBORN, LONDON, W.C.

SMALL GAS COOKING STOVE, No. 133, 12 in. wide. £1 15s.

London: Printed by WILLIAM BOUGHTON KING (at the office of Clayton and Co., 17, Bouverie Street, Fleet Street); and published by him at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, June 30, 1874.